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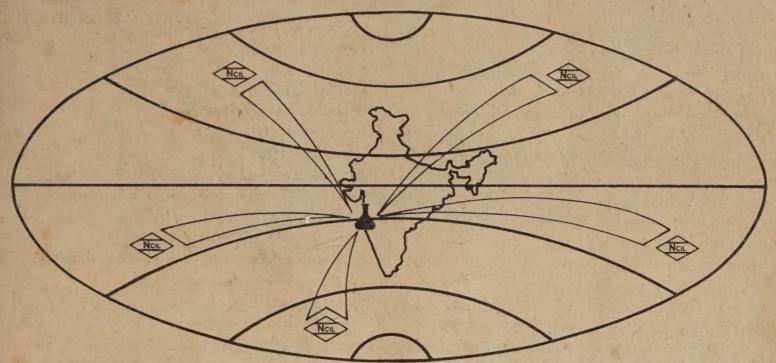


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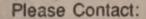
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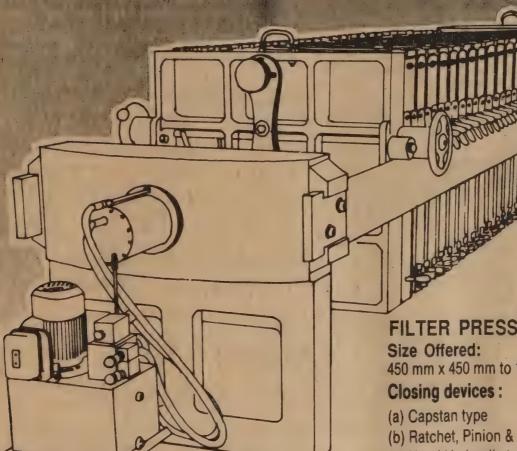
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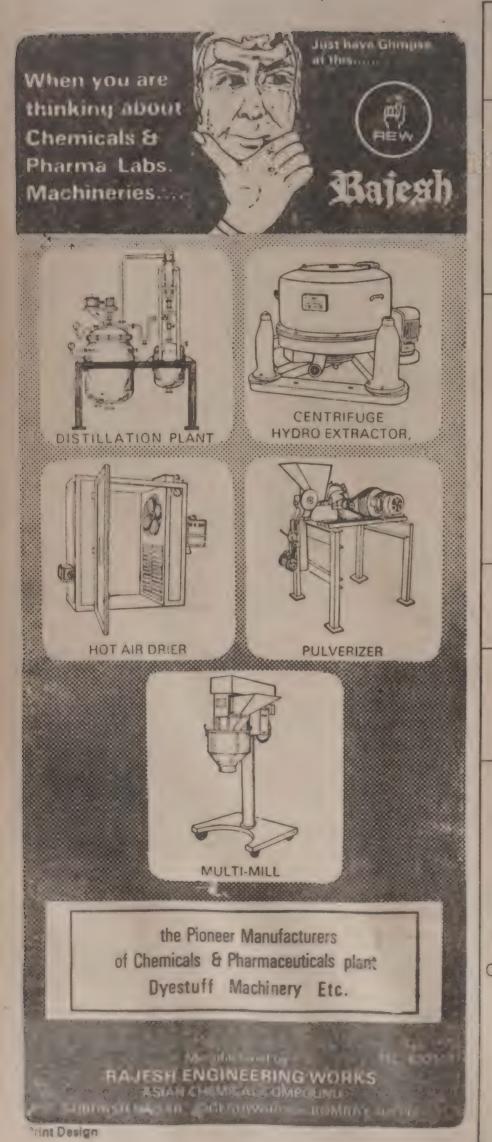
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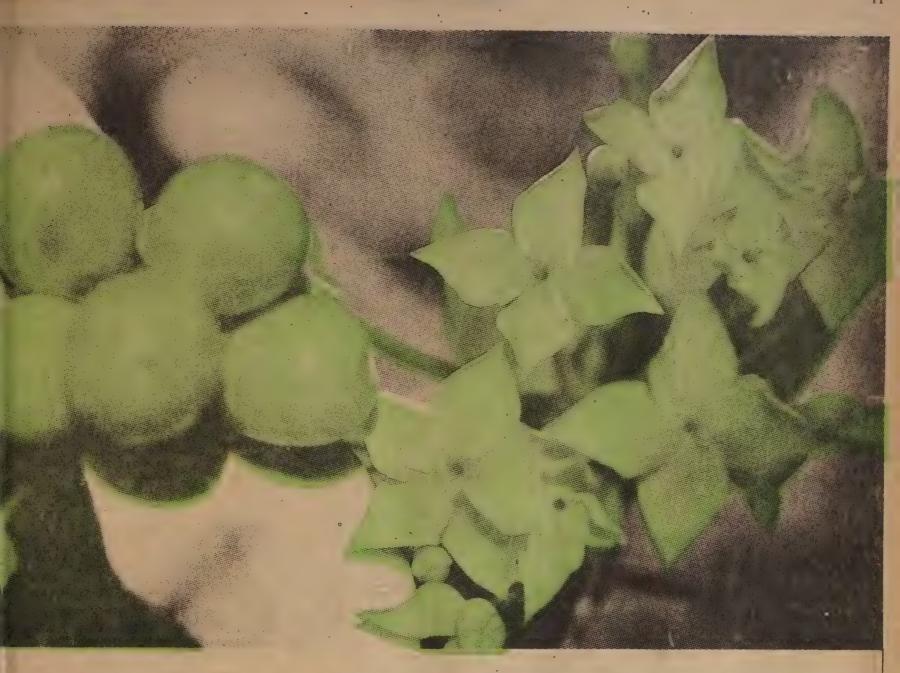
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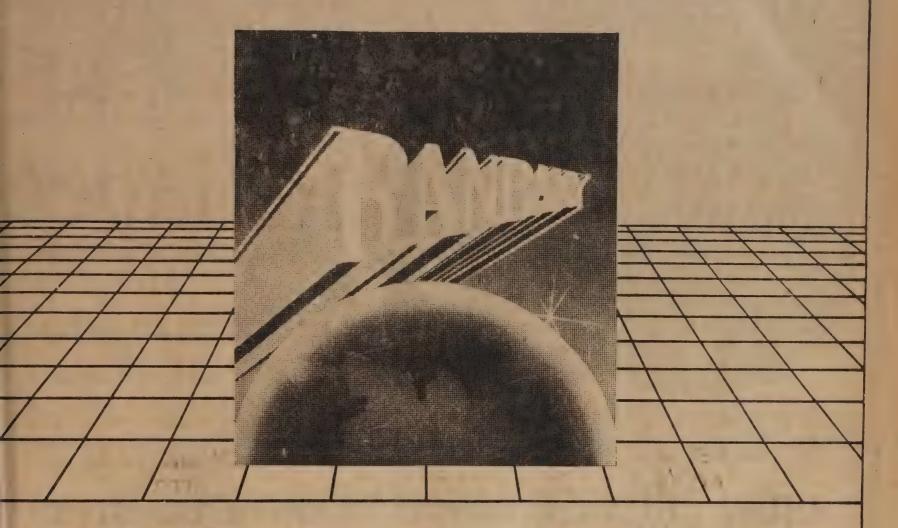
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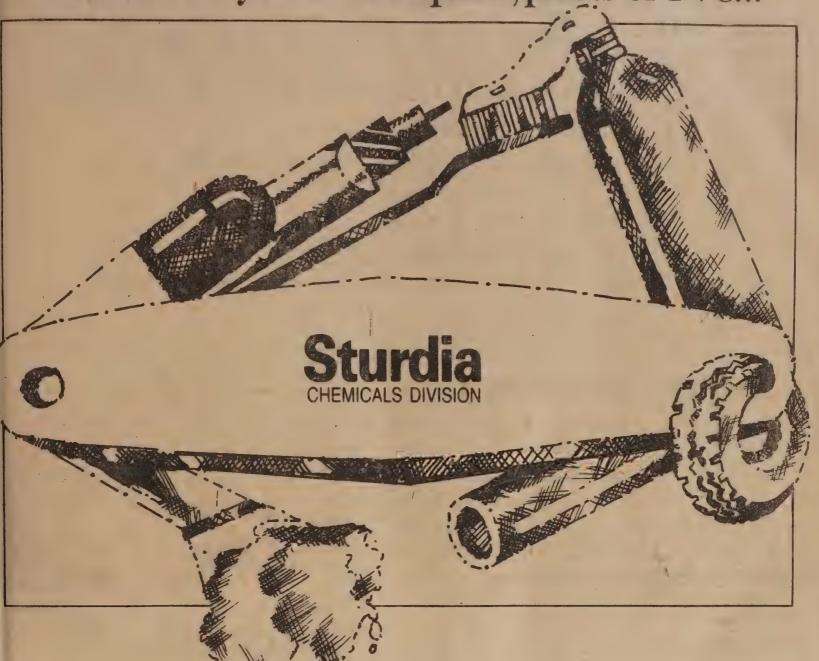
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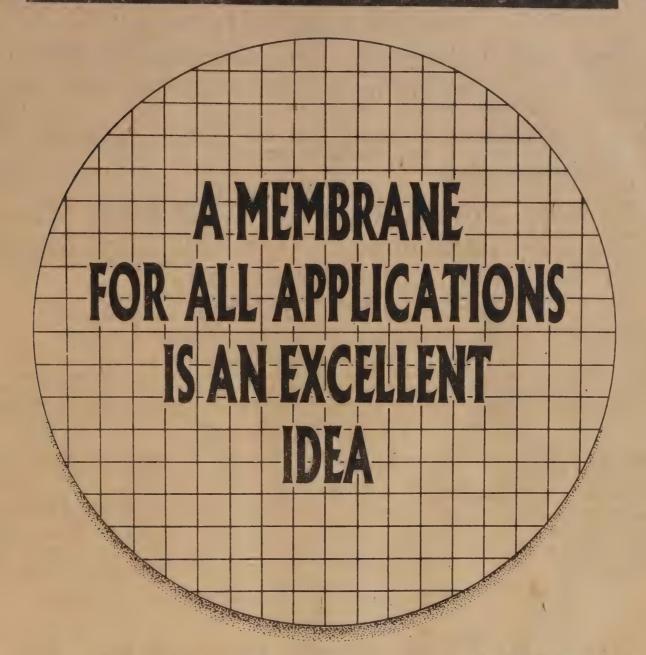
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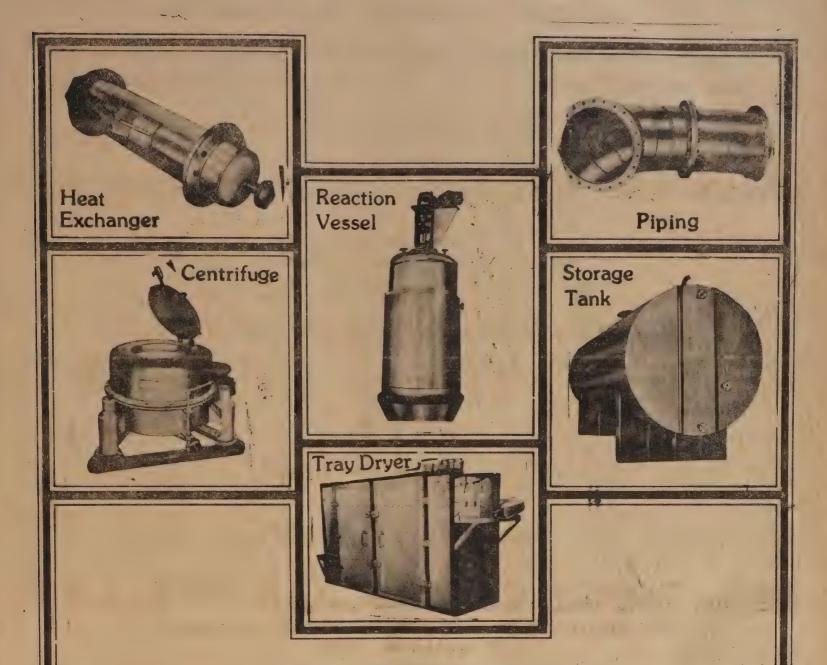
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CHEMICAL WEEKLY

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HERALDING THE 21st CENTURY - 24 (a) The future of the Chemical Industry

Will the chemical industry as we know it today exist in 2037? Dr.Duncan Davies, president of the Society of Chemical Industry put forward his theories on the shape of things to come in 1987.

In 50 years' time all the constituent parts of the present emical industry will be alive, well, and perhaps even more esperous than now. But instead of being similar and cohere, they will have diverged in shape, aim, and organizatinal pattern.

There may be a polymers service industry, that rents out oveable plants to make polyolefins at the well-head; and engineered products service industry, that develops materies as part of the design and manufacture of artefacts and unts governments among its main customers, especially for research and development. There may be an industrial and ricultural services industry (with give-away speciality emicals as part of the service); and a medical services lustry (which sells, among other things, pharmaceuticals).

Will it be logical or helpful to bracket these activities under title of "chemicals", when the skills deployed will ceruly include chemistry, but as an equal partner with comcer science and mechanical and control engineering?

The chemical industry over the past fifty years has made ngs beneficially different in a variety of craft-based induses by introducing new products and new systems for proction and marketing, using chemistry as the basis. This was period of "better things for better living through chemicals." It was different (and better) after we invented and reloped polyethylene, nylon and polyester fibres, antibiothetablockers, and so on. We dealt with the differences of the oil price went up in 1973, and invented materials voltaics, and other electronic and photonic chemicals.

But we all know that since the 1960's there has been a ses of unpleasant shocks to the profitability of most multisional chemical firms (which, structurally, were remark-

ably similar to one another), and that the individual responses have been such as to begin to destroy the similarities. Allied-Signal fronts on to aerospace, through the acquisition of Bendix; Monsanto has almost become a pharmaceutical and agro-chemical company like Ciba-Geigy; Du Pont is begining to look like a chemically-based engineering company, positioned to move also into business based on the "new biology", and ICI could now merge one-half into a bigger heavy chemicals and polymers company, while moving its other businesses nearer to their international markets.

The working hypothesis is that chemical firms developed their similar and cohesive multidivisional structures because of three factors. The first was the benefit of cross-subsidy between different product divisions in which unprofitable periods arrived at different times. The second was the pervasive impact of chemical invention on erstwhile craft-based industries; inventions sometimes arrived in the wrong place, and the movement of chemists between divisions provided useful cross-fertilisation. The third was the similarity of the development process in different markets, which again made it useful to move staff around so that lessons learnt in one place could be deployed in another.

But there was a countervailing disadvantage in multidivisional assemblies. It was difficult to get nearer to the market by acquisition or otherwise because such proposals tended to create competition with customers and so attracted opposition from sales directors. Now, cross-subsidy is not such an important factor. Chemical invention, though continuing, is less frequent, as is the appearance of new chemical products that can pay the (now much larger) entry fees for development. At the same time, the power of the retailers and others nearer to the customer has increased so that upstream

manufacturing profits are under attack. Thus, the (increased) disadvantage of difficulty in forward integration now outweighs the (reduced) advantages of cohesion. As a result, the chemical conglomerates are splitting up and reorganising in many ways, each according to its particular tactical opportunities. The resultant possible increase in diversity of policy in the ever more separate (and large) divisions is the matter on which we can make some forecasts.

First, and most obviously, separation of practice and policy between divisions in a chemical firm, should assist mergers of heavy chemical and polymer activities with those in other firms. This decreases the no. of heavy and polymer companies and makes it highly possible for them to tighten up on their competition and collaboration with the Middle East petrochemical operations. Thus it avoids the kind of chaos that so often has eroded technical progress in such mature inds.

Secondly, such separations should also make it easier for the special materials and components to change their policies and procedures so as to compete more effectively with their main competitors - the American aerospace and military systems companies. When the main customer is the govt. and its military agencies, marketing becomes a matter of winning contracts in political environment, rather than pleasing the citizen shopper. Generals and admirals are needed on the board to explain who matters and how to win his ear. Performance to promised cost and delivery time is required, while the appearance of a competitor is not a threat to current contracts. Such conditions need new attitudes and skills.

Thirdly, diversity in management should enable the speciality chemicals businesses increasingly to sell services, after the example of the oil industry service companies such as Schlumberger, and to move away from the practice of charging for such services as part of the chemical product price.

And fourthly, the unencumbered health care businesses should be able to integrate medicine, pharmaceutical product development, and the new computer and information capabilities that will be as important as recombinant DNA technology, by radical steps such as purchase and running of hospitals and the most innovative software companies. None of these changes would have been possible with chemical companies run as they were fifty years ago.

Most people working in the chemical industry have a view which consists mainly of their own industry and firm, its technology and competitors and something of its suppliers and customers. It is not always easy to realize that most people outside the industry see it as important and competent, but quite small and compact. More importantly, there is history and bitter experience in cotton, steel, shipbuilding, engineering and other trades, that provide clues about probable future events in the chemical industry.

First there is a study of institutions and their interactions, especially when they moved from expansion to maturity. This

teaches about structure organization and strategy and exter to the law, the state and the factors controlling the trade cyand, if you believe in it, the Kondratieff 50-year long was

Secondly, there is the study of what people want; what fators have favoured affluent materialism, asceticism, or way of religion with authoritarian hierarchies, where everyok nows his place and stays in it. Alonside this, one studit rivalry; the history of the chemical firms on Merseyside ov the period 1850-1940 reads like that of the Italian city stat and the Borgias; after the manner of Machiavelli this teach about customers and competitors.

Fourthly, there is the study of people, including the green, and their ideas. This tells us about our needs for ed cation and technology. Historians themselves are not encoraging about the use of their work in this way, but then the have no predictive obligations. They are not required to jutify investment in plants by economic analyses that require forecasts of prices, production levels and costs over a decador in research or overseas initiatives needing even longer views.

What are the indications and findings? First and foremose experience shows that the transitions in strategy, structure and policy are quite slow, and occur over periods of about 50 years or more. For example, a study in the early 1970 by Fisher and Pry of General Electric showed that product substitution - a much less intrusive matter than that of industry reshaping - can be treated algebraically, and typically take 50 years from 10% to 90% completion. This means that there is plenty of time during which the old practices of the chemical industry will continue, and will be crucial for cash flow while the new institutions are building up.

Thus, organisations like the Society of the Chemical Industry can continue with conferences and studies on the traditional subjects of chloralkali technology, hydrocarbor cracking, management and marketing while initiating activities in new areas such as retail - increasingly a source of heavy pressure on manufacturing - and industrial security - reflection of the ending of a century or more of unusual social peace. There is time for educational and basic technological transitions that are inevitably slow, and for those deeply attached to present conventions to serve out their time without trauma, provided they are not allowed to halt the necessary adaptations outside their immediate work.

Finally a study of the arrival of maturity in other industries shows it to generate the required structural adaptations at a level of pain that is unpleasant but not catastrophic. Most industries, paradoxically, seem to enjoy the greatest stability in strategy, nature of competition and identity of competitors during the period of most rapid growth - the time when they are penetrating the world economy with new products or services made possible by big technical advances.

- T.P.S. RAJAN

HEMARENA

.. VENKITESWARAN

Energy and GNP

is always interesting to speculate on the relation of energy the levels and GNP of different countries and more so when betroleum resources are dwindling and even if the worst cario forecast have not overtaken any country's economy ar, it is realised that the day of reckoning is not very far. To of the recent analysis of this vital subject is by Meur and Gere, Robert Kaufmann, David Skole and Charles Vosarty in their book "Beyond Oil: The threat to Food and I in the Coming Decades" - Reviewed in C & E News Dec 1, 1988.

the author's thesis is that traditional economist takes coner price, capital, labour as the only key factors of the nomy and ignore the question of energy which is the major ing force behind GNP. Capital does not substitute for egy but only helps in mobilising energy needed for the nomy.

he argument that the links between energy and GNP is reakable has been made often and until recently energy sumption and GNP have been highly correlated but there rgument on which is the driving force and which the en. Traditional theories project that energy consumption ows GNP while other theories postulate that energy drives ome scetors of GNP but follows in other sectors.

he authors firmly assert that energy drives GNP as it takes ain levels of energy use for production of any product ne economy and also for servicing the economy. But the nomy is also not running at the minimum energy levels often it is not necessary to produce products at the minm energy levels per unit of output. GNP cannot be linked te thermodynamics and thus cannot be a form for such k in terms of keal per dollar of GNP, even if there is reality of energy/GNP consumption link. The external gy input is as much more in a highly mechanised sociand far less for a society's like India's with a high level anual energy input. GNP and energy ratio is widely varand dependent on price and other factors. There are also urces other than energy such as metals and chemicals ed to GNP and these are affected by energy variations prices will be more difficult to evaluate though coms may provide some guidance.

With the various levels of energy inputs (other than natural sources like single shift in manual labour) in relation to GNP it is difficult to predict on how much energy will be consumed in future. When we also talk of an era beyond oil we necessarily assume certain estimates of future fuel use and of a mix of fuels.

The book "Beyond Oil" leans towards those who advocate soft energy options and organic farming. It forecasts that unless counter measures are taken per capita GNP will decline from 1997 due to depletion of easily extractable oil and gas resources. This is a widely accepted view even if many will argue that 1992 is too early a date for decline. Countries have already been taking steps to raise effeciency of energy use and keep the GNP with lower input levels viz. motor cars with greatly enhanced mileage on petrol and substitution of plastics or other materials for metals to reduce weight and also higher levels of recycling.

Of course these steps are under the category of counter measures advocated by the authors. But we are not alive to the need to adopt such measures in other vital sectors of the economy such as agriculture which continues to be energy intensive in advanced countries. Also the energy spent in extracting resources (fuels or metals) continue to go up all the time when the readily available resources dry up. Also the use of coal and nuclear power get circumscribed by environmental regulations and constraints including the build-up of CO₂ levels in the atmosphere. The moves towards alternate resources of energy and resource conservation cannot be ignored much longer whether we agree or not that energy is the key factor in the world's economy and GNP. There is no escape from looking beyond oil and gas (and coal also) and evolve adjustments which can vary from country to country. Much is expected of biomass sources and solar power through technology breakthrough, wind and tidal power - perhaps at a higher level of costs.

India is at the crossroads with low GNP per capita, poor resources in the energy sector, glaring disparities in income which can be rectified only by higher energy input levels and the population pressure. Our problems are far more acute and delays would be disastrous.

Petroleum Production and Demand

A recent report in the "Hindu" analyses the import and price problems on petroleum and the severe constraints that could arise in the next few years. The data on crude oil and natural gas output, imports of these and total net imports over the last few years as detailed therein is shown in the table below.

The crude production after a stagnant 3 years has risen by a token 2 MT (7.6%) last year. The availability of gas is in plenty and production had not risen due to the limited usage. Only the last 2 years have shown a big rise (30% in 3 years) due to the HBJ pipeline and the newer gas based fertiliser plants. But even now priority is naturally on using all associated gas and draw on natural gas only to supplement. But natural gas reserves are an appreciating asset for years to go and there is no compulsion to produce and use it. The opening out of gas for use as an energy source and electric power has helped in the demand and production going up. Direct reduction of iron ore with gas provides another opportunity.

While the gas position is very comfortable except of embarrassing surpluses in Tripura and the growing promise of the KG and Kaveri basins, the situation in oil is certainly not one of promise. The only significant find is the Gandhar fields from which 2 to 3 million tonnes/year oil and 5 million m³ of gas/day are expected in the 8th Plan. The production expected from the east coast or Assam is only of token quantities, far too insignificant to bridge the gap between demand and supplies from indigenous sources. Prices have hardened and are on the uptrend with Rs. 4038 crores of imports in 1987-88 and 13.12 million tonnes crude plus 4.53 million tonnes products in nine months of the current year at a cost of around Rs. 3600 crores already.

Another lacuna is the limiting refining capacity with progress in in new refineries and rumours of both Ma lore and Assam projects being deferred for want of resces. Meanwhile we find active pursuit of crude oil pipe from Kandla to Karnal (imported crude) at a heavy cost obvious strain on even the limited resources. It is rather untunate that there is an absence of clear perceptions and obtives in petroleum planning for the next decade and hesita to face the economic realities. Efforts to curb consump is apparantly anathema to our policy makers who have at dant optimism about our potential to produce oil.

Another report refers to streamlining of decisions action through the consitution of an empowered commi of Secretaries with high financial powers to give a fillip oil exploration and production in the 8th Plan. This co mittee is to submit proposals to the Cabinet Committee Economic Affairs for approval and clearance. The target 8th Plan already envisaged at 45 million tonnes is to be rail to 50 million tonnes by 1994-95 through an Accelerated P duction Plan. It may be mentioned that the production 1989-90 is expected at 31.41 million tonnes (MT) oil a 8.69 MT of oil equivalent of gas - an increase of 2.83 n lion tonnes overall but only 1.8 million tonnes of oil or le than 6%. Great hopes centre around the potential from nev areas in onshore Gujarat and Assam and the Eastern onsho and offshore areas. Over 2 MT (more of gas than oil); envisaged from this. The expectation of additional 10 M from Western Coastal areas may prove to be uncertain.

Overall trends in the Petroleum Sector

	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89 (estima (in millon tonn
Output of crude	1: 21.07	: - 26.02	28.99	30.17	30.48	30.36	32.11
Output of natural gas in bill. cu. metres.	4.94	5.96	7.24	8.13	9.85		12.83
Throughput of refineries	33.16	. 35.26	35.56	42.91	45.70	47.75	45.50
Output-refined products	31.07	32.93	33.24	39.88	42.76	. 44.73	45.4
Gross imports							
Crude: Quantity	16.95	15.97	13.65	15.14	15.48	18.05	17.49
Value (Rs. crores)	4,043.74	3,541.05	3,430.34	3,686.80	2,120.00	3,065.00	2,740.00
Petroleum Prod. quantity	5.03	4.33	6.09	3.87	3.05	3.93	6.04
Value (Rs. crores)	1,553.94	1,270.75	1,914.91	1,273.60	653.00	973.00	1,353.00
Total quantity	21.98	20.30	19.74	19.01		21.98	23.53
Value	5,597.98	4,811.80	5,345.25	4,960.40	2,773.00	4,038.00	4,093.00
Net imports							
Crude: Quantity	12.40	10.45	7.16	14.62	15.48	18.05	17.49
Value (Rs. crores)	2,980.37	2,309.95	1,867.18	3,551.65	2,120.00	3,065.00	2,740 00
Petroleum prod. Quantity	4.23	2.86	5.16	1.90	0.56	0.52	3 93
: (Rs. Crores)	1,420.16	913.69	1,659.88	764.02	242.00	324.00	888.00
Total net imports Quan.	16.63	13.30	12.32	16.52	16.03	18.56	21.43
Value (Rs. crores)	4,400.53	3,223.74	3,527.06	4,315.67	2,362.00	3,389 00	3,628.00

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Industrial alcohol export in jeopardy

Export of industrial alcohol from India may come to a halt soon. The storage facility for alcohol at Kandla port, which has the largest alcohol jetty is almost nil.

The storage tanks at the jetty have all been heavily booked by exporters of other cargo, according to informed sources.

The government has sanctioned the export of a total of 1200 lakh litres since last year in the context of a serious glut of industrial alcohol in the country.

Although distilleries have obtained orders for the export of over 600 lakh litres they could export only 300 lakh litres so far. Another 100 lakh litres may be exported shortly.

The sources said that it would be almost impossible to effect exports now as there is virtually no storage capacity left at the Kandla port.

The sources also said that distilleries have already obtained a good price of about 400 dollars (f.o.b.) a tonne as Brazil, the largest exporter of alcohol to Europe has cut its export since last year.

India has been facing an alcohol glut for some time as some of the major users of alcohol like Synthetic & Chemicals, Indian Explosives and Union Carbide stopped using alcohol for their production.

The imposition of various levies by Uttar Pradesh on the movement of alcohol from UP to other states also created a situation of huge surplus in UP while many other states are in deficit.

The price of alcohol in UP has thus come down to Rs. 2 a litre and in Maharashtra to Rs. 3 a litre. Against this, the export price works out to Rs. 5 a litre at the price of 400 dollars a tonne. The sources pointed out that the glut was going to be still worse in the current

year with the expected bumper sugar production of 100 lakh tonnes during the current season.

The production of alcohol in UP is estimated at 3,000 lakh litres during the current season, whereas the total requirement in the state is placed at 1,800 lakh litres. Maharashtra, the second largest producer of alcohol in the country, will also have a surplus of 300 lakh litres in the current season. Maharashtra is expected to produce 1,800 lakh litres this season.

ADARSH CHEMICALS

Adarsh Chemicals & Fertilisers fared well during the year ended Mar 1989. Net sales during the year h been Rs. 18.44 crores against Rs. 12 crores in the previous 15 months. company has earned a gross profit Rs. 334.55 lakhs against Rs. 69 lakhs. After providing Rs. 53 la (Rs. 51.77 lakhs) for depreciation a Rs. 135 lakhs (Rs. 2.85 lakhs) for tation, there is a net profit of Rs. 146 lakhs against Rs. 15.04 lakhs in the prious 15 months.

Chloro acetyl chloride industry in a fix

The indigenous chloro acetyl chloride industry is facing a grave crisis Chloro acetyl chloride is an intermed iate for the manufacture of butachlor a weedicide. It is also used for producing lidocaine, xylocaine, etc. There are several units producing chloro acetyl chloride, both in the organised and the small scale sector. The total installed capacity of chloro acetyl chloride in the country is 1400 M.T.P.A. This quantity is more than sufficient to meet the country's total demand. The projected demand of butachlor for the year 1989-90 is 2000 MTs. Considering this, the total requirement of chloro acetyl chloride works out to only 800 MTs.

Inspite of the above existing scenario the central government vide its public Notice No. 219/88 Customs dated 18.7.88, reduced import duty on chloro acetyl chloride from the basic duty of 70% to 15% and also abolished the CVD which is charged in lieu of excise. As a result of this the landed cost of imported material is almost 30% lower than indigenous material. The international manufacturers have also resorted to dumping. Price has been reduced from \$1800 per MT to \$1600 per MT with a credit period of 180 days.

The indigenous manufacturers as herefore finding it difficult to se chloro acetyl chloride to butachlo manufacturers.

The government has been voicing its concern about India's balance of payments and the widening gas between the bills of the Imports and Exports. Due to the above policy the country is losing approximately Rs. crores worth of precious foreign exchange. Several representation have been made to the Ministry. Seems to have fallen on deaf ears.

The situation is extremely serious a indigenous manufacturing of chloracetyl chloride has come to a halt. I immediate relief is not given, the plants will become permanently idle

It is in the interest of both government and the indigenous manufacturers of chloro acetyl chloride that tarif protection be given to the indigenous manufacturers.

It would help the indigenous man ufacturers use their huge investment and also save the country valuable for eign exchange. It is high time the gov emment takes immediate action an helps the indigenous industry.



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I.C.M.A. Awards 1988

I.C.M.A. ACHARYA P.C. RAY AWARD FOR DEVELOPMENT OF TECHNOLOGY INDIGENOUSLY

The "I.C.M.A. Acharya P.C. Ray Award For Development of Technology Indig nously" has been won by Ranbaxy Laboratories Limited, New Delhi, for introducing a number of important drugs, from basic stage, involving high-tech; in some cases they have a pioneering status. The production of anti-bacterial doxycycline hyclae involves hazardous chemicals and tricky steps involving even stereo-specific synthesis and is a closely guarded secret world over

CITATION

Ranbaxy Laboratories Limited have pioneered the introduction in India of a number of important drugs, involving high technology. The production of anti-bacterial Doxycycline Hyclate involves hazardous chemicals and complicated reactions, involving stereospecific synthesis. The other important drugs from the house of Ranbaxy include Ranitidine, Norfloxacin and Nalidixic acid. The innovative technologies developed by the company have enabled them to export drugs even to the developed economics.

In recognition of these achievements sustained over a protracted period, in developing highly innovative technologies from basic raw materials, involving complex organic chemistry and difficult engineering the Indian Chemical Manufacturers Association is happy to confer the I.C.M.A. Acharya P.C. Ray AWARD FOR DEVELOPMENT OF TECHNOLOGY INDIGENOUSLY for 1988 on Ranbaxy Laboratories Limited, New Delhi.

LCM.A. AWARD FOR PROCESS DESIGN AND ENGINEERING OF UNEMICAL PLANTS

Obacla Cormicals Ltd. have clinched
Award For Process
Design and Engineering of Chemical
for breakthrough in
hnology for cypermeth
based on basic raw

materials, which follows a route that has no parellel in the world. This process stands out as a shining example of clever adoption of telomerization reaction to build a monomer and also for utilising in an innovative way 2+2 cycloaddition and Favorski rearrangement.

CITATION

Gharda Chemicals Limited have achieved a breakthrough in developing technology for Cypermethric acid chloride, starting from basic raw materials, following perhaps an unique route. This process stands out as a shining example of the adoption of telomerization reaction to build a monomer and of the innovative use of 2+2 Cycloaddition and Favorski rearrangement. Another significant aspect of the process lies in its ability to manufacture 90% cis isomer. The engineering design of this multi-step process is very complex.

In recognition of the novel adoption of several types of organic reactions, coupled with the innovative engineering of the process, in production of a sophisticated intermediate for agrochemicals, the Indian Chemical Manufacturers Association is happy to confer the I.C.M.A. AWARD FOR PROCESS DESIGN AND ENGINFERING OF CHEMICAL PLANTS for 1988 on Gharda Chemicals Ltd., Bombay.

I.C.M.A. AWARD FOR ENVIRON-MENTAL CONTROL STRATE-GIES AND SAFETY IN CHEMI-CAL PLANTS

The "I.C.M.A. Award For Environmental Control Strategies And Safety in Chemical Plants" goes to Bayer (India) Limited, Bombay, for their significant contribution towards environment preservation and pollution control through use, for the first time in India, of 'Tower Biology' for central biological treatment of waste-water containing a host of pollutants and for developing a rotary kiln incinerator to deal with a variety of solid, liquid and gaseous streams. This plant is the first one outside West Germany, based on the latest aerobic technique development by Bayer.

CITATION

Bayer (India) Ltd. have used, for first time in India, an aerobic process sed on a vertical tower for the cent biological treatment of waste-was containing a host of pollutants. Furth the company has developed a rotary lincincrator with waste heat recovery a scrubbing systems for flue gases to eminate a variety of solid, liquid and geous streams, as an add-on plant to coply with exacting environment requirements.

In recognition of the company's contribution in introducing sophistical technology in India to treat componixtures for abatement of pollution an effective manner, the Indian Cheical Manufacturers Association is hap to confer the I.C.M.A. AWARD FOR ENVIRONMENTAL CONTROSTRATEGIES AND SAFETY CHEMICAL PLANTS for 1988 Bayer (India) Ltd. Bombay.

I.C.M.A. AWARD FOR NOVEL ENERGY CONSERVATION AN INTEGRATION PROGRAMME CHEMICAL PLANTS

The "I.C.M.A. Award For Nor Energy Conservation And Integration Programme in Chemical Plants" is been won by Chemicals and Plast India Limited, Madras. CHEMPLAS have established, for the first time in India, a Combined Cycle Power Plant. It sed on Low Sulphur Heavy Sto (LSHS), to meet the total power a steam requirements of the plant in a reable way -- representing a major breat through in total integration with the Process Plant.

CITATION

CHEMPLAST has established for the first time in India a Combined Cyc. Power Plant, based on Low Sulph Heavy Stock (LSHS), to meet the topower and steam requirements of the plant in a reliable way. The operation of the company, which involve must facturing stages for ethylene, vinylich ride monomer and PVC, apart from ter-linking with the neighbouring child.

ali complex have benefited immensefrom this novel integration exercise. In recognition of the successful adopno of LSHS for Combined Cycle Opeions, which could have created veral operational problems, the Indian memical Manufacturers Association is appy to confer the I.C.M.A. AWARD OR NOVEL ENERGY CONSER-ATION AND INTEGRATION ROGRAMME IN CHEMICAL ANTS for 1988 on Chemicals and astics India Limited, Madras.

C.M.A. AWARD FOR EXPORT F CHEMICAL PRODUCTS

Lupin Laboratories Limited, ombay, has bagged the "I.C.M.A. ward For Export of Chemical Products" for successfully penetrating and tablishing itself as the major player in e international markets for a basic alk drug -- Ethambutol. Lupin exports thambutol to many countries of the orld spread over Asia, Africa, Europe, and South and North America.

CITATION

Lupin Laboratories Ltd. has successally penetrated the international marets for Ethambutol -- an important ati-T.B. drug, and established itself as major player. Ethambutol is a drug hich prevents scourge of many impverished people in developing counies. Lupin has also established a eading position in some other vital rugs for domestic consumption and has nunched them in a modest way in export markets as well.

In recognition of successful development of an efficient technology which llowed the company to aggressively inter into the world markets with an important bulk drug in an impressive ray, the Indian Chemical Manufactures Association is happy to confer the C.M.A. AWARD FOR EXPORT OF HEMICAL PRODUCTS for 1988 on upin Laboratories Limited, Bombay. **THER AWARDS

Two other ICMA Awards viz., for ovel and complex technology for first me in India and award for innovative

and purposeful programmes for social progress have been passed over.

INDIAN UNIT SELLS TO DRUG PATENT HOLDER

Pharmaceutical multinationals, who swear by product patent, and frown at Indian Patent Act of 1976, are not averse to taking advantage of products of India's liberal law when it suits them. Glaxo still enjoys patent protection for ranitidine in Europe and America. The billion dollar turnover drug has made the UK multinational climb up the ladder to become the world's second largest drug company, second only to Merck of the United States.

According to reliable industry sources, Glaxo UK has begun importing ranitidine intermediate from Dr. Reddy's Laboratories of Hyderabad. Dr. Reddy's Labs makes ranitidine through a process unique to it, quite different from that of Glaxo's. It is already making ranitidine from the very basic stage and marketing it in the country.

Glaxo's Indian affiliate, Glindia, imports the intermediate for ranitidine.

Industry sources point out that had India been a signatory to Paris Convention, only Glindia could market the product in India. No other unit would be allowed to produce the drug from any process whatsoever. The Govt. cannot control the drug price either. Thanks to a number of units marketing ranitidine, the drug is cheaper in India compared to rest of the world, including neighbouring countries like Pakistan.

PACT ON RAISING OIL PRODUCTION

OPEC Oil Ministers reached an agreement on June 7, to raise production in an effort to keep prices strong in the coming months. All Ministers of the 13-nation Organisation of Petroleum Exporting Countries signed the pact for boosting output to 19.5 million barrels a day for the last half of the year, a one-million barrel a day rise from the current maximum.

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RIL proposals to set up refinery rejected

The Union government has shot down two proposals of Reliance Industries to set up refineries at a total cost of Rs. 2.555 crores.

These ambitious backward linkage plans of Reliance have been turned down on the ground that refineries are still very much a prerogative of the public sector and no private party is to be entertained in this regard.

According to official sources, RIL had sought government permission to set up the first refinery for processing six million tonnes of crude oil to make 90,000 tonnes per annum (tpa) of C-3 LPG, 1,30,000 tpa of C-4 LPG, 10,00,000 tpa of gasolene, 10,00,000 tpa of kerosene/ATF, 17,00,000 tpa of diesel oil and and 15,70,000 tpa of fuel oil.

The estimated cost of this project. proposed to be located around Bharuch in Gujarat or at a suitable area on the West Coast, is placed around Rs. 1,735 crores. The project, as per the proposal, was to be funded by issuing equity capital, preference capital, loans from financial institutions, foreign exchange loans and internal cash accruals.

Objections to the company's proposals came from one Madhubhai Patel purely on grounds of location and environment.

The second proposal related to the processing of two million tonnes of residual crude oil (lube bearing) for making the following items: 1,00,000 tpa high viscosity lube oils (bright stocks), 50,000 tpa of transformer oil base stock, 25,000 tpa of 150 neutral base stock HVI (base stock), 1,90,000 tpa of 500 neutral HVI base stock, 35,000 tpa of 1300 neutral HVA base stock, 4,25,000 tpa of carbon black feed stock, 5,60,000 tpa of asphalt paving grade, 4,80,000 tpa of light distillates for light diesel oil and 35,000 tpa of slack

According to official sources, this project was envisaged to cost Rs. 820 crores with the location in Bharuch or any other area in the West Coast. The funds were to be raised through the issue of equity capital, internal cash accruals, debentures, loans from financial institutions and foreign exchange

In the case of both the projects, RIL proposed to set up separate units. The government argument in rejecting the two proposals was common. It maintained that refineries were reserved

under the industrial policy resolution the government.

KRIPA CHEMICALS EXPAND

Kripa Chemicals Pvt. Ltd., a "m giant" from Pune is surging ahead w expansion of acid slurry production a recorded capacity of 100 tonnes day. It is likely that "Kripa" will be largest producer of "Acid Slurry" India today.

Talking to newsmen, the young a dynamic chief of Kripa, Mr. Raghuve B. Joshi said that plans are also afo to put a detergent plant (spray dri washing powder). The detergent pla is expected to be commissioned by m July. With the commissioning of the plant, "Kripa" will achieve a turnov of over Rs. 25 crores. Mr. Joshi al informed "CHEMICAL WEEKLY that the company had started manufa turing sodium lauryl sulphate (powder needle) in large quantities, catering cosmetics, pharmaceuticals and oth industries.

Making a humble beginning in the year 1968, Mr. Raghuveer B. Jos started manufacturing of acid slur with a capacity of 50 to 60 tons. M Joshi received the prestigious "Udyo Patra" award at the hands of the the vice President of India Mr. Hidayatu lah for self made industrialist in 198

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Energy, radiation to be brought under EPA

The government of India is thinking of bringing in energy and radiation under the ambit of the Environmental Protection Act (EPA) of 1986, according to Capt. Raja Rao, director, department of ecology and environment, government of Karnataka.

Addressing a one-day seminar on the "environmental impact assessment of urban development and planning", Capt. Rao noted that the Union government was in the process of drafting rules and regulations on the management of hazardous chemical substances, including the disposal of nuclear waste. He noted that this move was still at a preliminary stage, with clarifications being sought by the state government.

Capt. Rao however felt that there was a need to empower the state governments to shift polluting industries, which only the Central government had the authority to do under the EPA. At present, the state government only had the power under the "Clean Air and Water Act" to go in for the rather extreme and time-consuming step of ordering the closure of polluting industries. It would help, he said, if the states could initiate less drastic and more immediate action like levying spot-fines.

Capt. Rao noted that the enactment of the EPA had enabled the Karnataka State Pollution Control Board (KSPCB) to do something with regard to polluting industries. The 35 per cent budgetary reduction in the duty on imported air-pollution control equipment was, he added, a step in the right direction. He however pointed out that the level of carbon monoxide was not being monitored because the equipment was not there and that carcinogens could not be measured because the standards had not yet been laid down.

Mr. M.N. Jayaprakash, regional officer, KSPCB, noted that five stations in Bangalore had been included in the national ambient air quality monitoring programme. Only one of these stations,

the Ananda Rao Circle (a mixed-use area, both residential and commercial), had been found to have a pollution level in excess of the maximum permissible norm of 500 micrograms per cubic metre.

Tests, he added, had also been conducted on the emission of pollutants for different categories of vehicles and it had been found that 73 per cent of four-wheelers using petrol and 70 per cent of diesel vehicles were not meeting the required standards. The corresponding figures for two-and-three wheelers was 16 per cent for those below 50 cc and 30 per cent for those above 50 cc, he said.

Ms. Jija Harisingh, deputy commissioner of police (traffic), Bangalore, noted that there was a project for the pedestrianisation of more streets in the city so as to reduce the incidence of pollution from automobiles which was now more than that of industrial pollution. She called for "a happy marriage of public awareness with institutional mechanisms so as to bring back the crisp, clean, fragrant air for which Bangalore had once been famous.

Endorsing this view, Mr. Lukose Vallathrai, deputy secretary, department of ecology and environment, government of Karnataka, suggested that socially aware citizens get together to form a pressure group which would come up with concrete suggestions for improving the environment of the garden city.

Mr. R.P. Shavi, chairman, KSPCB, noted that hardly any of the municipalities in the state were treating sewage. While action had been taken against two of the 173 local bodies, the problem, he felt, was one of a constraint on resources and what was perhaps needed was funding from multilateral agencies like the World Bank.

Inaugurating the seminar, the chairman and managing director of Bharat Earth Movers Ltd. (BEML), Mr. M.B. Ajwani, stressed the need tor a balanced

or judicious selection of utilities for benefit of the community, wheth was a question of introducing a technology or setting up a new particle. The former KSPCB chairman, Hanumantha Rao, stressed the need instrumentation in the field of intertional engineering, particularly in a like surveying and monitoring.

The president of the Karnataka and Centre of the Institution of Engire (India), IE(I) Mr. R. Doreswamy, In that the greenhouse effect was also there "and that we have moved from stage of global warming to one of global wa

PESTICIDES FORMULATORS ASSOCIATION OF INDIA

Indian Institute of Managem Ahmedabad & Pesticides Formula Association of India (SSI) Borr announce a seminar on (1) Overview Pesticides Industry & Marketing E ronment, (2) Strategy Formulations Marketing of Pesticides, (3) Implementation of Marketing strategy.

Date: 1st July 1989

Time: 9.15 A.M. to 5.30 P.M.

Venue: Regal Room No. 3, H Oberoi Towers, Nariman Po Bombay-400 021.

Subject: 1) Dr. U.K. Srivastava overview of Pesticides Industry Marketing Environment.

2) Dr. S.P. Seetharaman Strat Formulation for Marketing of Pe cides.

3) Dr. S.P. Seetharaman Implemention of Marketing Strategy.

Fees: Rs. 350 per participant (for Pl members) & Rs. 450 per participant Non-members). This will cover the of background literature, tea/cof lunch).

Last date for nomination: 21st J 1989 upto 4 P.M.

Plan to export acetic acid

Acetic acid is poised to join the list India's exports. Producers are getting quiries from Far-east buyers who are oting \$530 per tonne (naked) c.i.f. garded as a good price.

Deemed export of the material has eady begun. Apart from the favourle international price, increased mestic production and softening price is prompted producers to look overas. Price has fallen to Rs. 10.50 from the peak of Rs. 12.50 a kg prevailing ly six months ago.

Expansion of capacities by products in Uttar Pradesh, Maharashtra and mil Nadu may further depress the priunless the export market is cultivated. The domestic demand is poised for a big mp in the coming decade with the pected commissioning of the two new TA plants.

Current production is estimated at ound 90,000 tonnes, ahead of a mand of around 80,000 tonnes. The dustry is growing around 10 per cent. Ecohol exports are getting bogged own in red tape. Out of a quota of 250 lakh litres, only about 300 lakh mes has actually been shipped. The overnment has granted the licence to ate Trading Corporation which in turn is nominated All-India Distilleries association (AIDA) as the export and some and

AIDA has to be "persuaded" to grant mission without which no distiller n export. One distiller-exporter has ked storage space in Kandla and is lling to let it out to potential export-for a consideration, depriving direct porters of infrastructural facilities.

The price of \$250 to \$300 per kilo ie is quite attractive but distillers implain that middlemen traders are tking money at their expenses. There is strong case for placing alcohol in OGL list as long as the surplus sittion continues.

Rs. 1,643 CRORE DRUGS, COS-METICS OUTPUT BY GUJARAT

Drugs and cosmetics worth Rs. 1,643 crores were produced in Gujarat, while Rs. 200 crores worth were exported during the year 1988. About Rs. 640 crores were invested in pharmacy industries in which about 50,000 persons are employed, according to a spokesman of the Gujarat Government.

During the last year, 530 fresh manufacturing licences were granted and 1,170 old licences were renewed. 4,170 licences were granted for sales of drugs and 6,377 old licences were renewed by the Food and Drugs Control Administration of Gujarat State.

Food and Drugs Laboratory, Baroda had tested 5,070 samples of drugs, out of which 744 samples were reported to be of sub-standard quality. Permission for manufacturing 73 drugs was with-

drawn and 175 manufacturing licences and 1,242 sales licences were admitted in different courts including pending cases of earlier years.

About 80 complaints were investigated while 2,797 manufacturing units and 10,574 sales units were inspected during the year.

Necessary action were taken for short supply of 185 drugs. Under the provisions of Drugs and Magic Remedies Objectionable Advertisement Act, 25,312 advertisements were screened, out of which 191 were found objectionable.

Sixty-two manufacturers were asked to stop manufacturing of 81 drugs. Permission of manufacturing 45 drugs produced by 38 manufacturers were withdrawn while manufacturing licences of 6 units were suspended.

Permission to manufacture 8 drugs by six manufacturers were withdrawn and their licences were suspended.

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JK Aromatics to work on Saleempur project

The JK Organisation is bracing itself up to implement the prestigious Rs. 850-crore Saleempur aromatics project.

The JK Group had bagged the project against stiff resistance from Reliance Industries, the Birlas and the Thapars. It is learnt that the promoters, JK Synthetics Ltd., have received the official communication in this regard from the Industry Ministry.

The Cabinet Committee on Economic Affairs is understood to have given its nod to the proposal only recently and a letter of intent has been sent to JK Synthetics for the manufacture of 30,000 tonnes per annum of benzene, 30,000 tonnes of orthoxylene, 1,05,000 tonnes of paraxylene and 1,50,000 tonnes of PTA.

On its part, the JK Group has floated a new company by the name of JK Aromatics Ltd. to implement the project. The new company is promoted by JK Synthetics Ltd. in the private sector. JK Synthetics is to contribute about Rs. 65-70 crores as equity towards the project along with its associates.

Consultations are also on to decide the nature of collaborations with foreign parties for transfer of technology for the cracker complex. Some sort of foreign equity participation is also expected in the project.

However, because of the diversified nature of products the technical collaboration agreement is unlikely to be signed with only one party. Company sources confirmed that separate agreements may be reached for different products.

For the aromatic portion, IFP and Arco of France are competing with Mobil of the US, whereas for the PTA manufacture Amoco of the US, ICI of

the UK and Mitsubishi Petrochemicals of Japan are in the fray.

The project, to be located at Saleempur in Aligarh district of Uttar Pradesh, will entail a foreign exchange outgo of Rs. 240 crores. The required exchange resources will partly be raised by foreign collaborations and a convertible debenture issue abroad.

The company plans to raise the Indian portion of the equity through a fully convertible debenture issue. The foreign collaborators are also expected to put in Rs. 50-60 crores.

Work has already started on land development at the site, company sources say. The Government has earmarked land for the project, and this has to be duly acquired. The entire project is estimated to take 30 to 36 months to complete.

Naphtha is the basic raw material for the plant which will be supplied by the Mathura Refinery. JK Aromatics does not foresee any problems on the marketing front.

Out of the proposed capacity of 1,50,000 tonnes of PTA, JK Group companies like JK Synthetics, Orissa Synthetics and Raymonds expect to consume about a lakh tonne per annum. For the rest there is an assured market, company sources say.

Benzene, which will be a by-product in the process, also has an assured market, according to the spokesman of the company.

Naphtha derived from the Bombay High is rich in aromatics. The proposed production facilities will help in recovering valuable aromatics and giving added value to feedstock naphtha which is otherwise being used only as lowvalue gasoline.

NEW DRUG LAUNCHED

Lederle, the pharmaceutical divis of Cynamid India Ltd. has launched, the first time in India, a new bro spectrum antibiotic, cynomycin. I drug is an original research product Lederle.

According to a company press lease, cynomycin is already marketed over 50 countries the world over. I company has carried out extensive clical trials in India and will manufact the drug at its factory at Valsad in G arat.

Cynomycin will provide Indian de tors a superior alternative to penicill ampicillin, cephalosporins, norfloxad and other antibiotics against susceptil organisms, the press release adds.

IOC TO SET UP HYDRO-CRACKER PLANT

The country's first hydrocracker project with the latest technology, to be sup at the Indian Oil Corporation's Grarat refinery near Baroda at a cost Rs. 635 crores, when completed be February 1992, would convert 1.2 m lion tonnes (MT) of residual oil in products like kerosene, liquid petroleu gas and high speed diesel.

The executive director of the refin ery Mr. A.P. Chaudhary told reporte at Baroda recently that it would include a feed unit with 2.5 metric tonnes capa ity per annum (MTPA), a 600 MCU p hour capacity nitrogen unit, a sulphi recovery unit with waste water trea ment and sour water stripper plant Firms from the US, West German Poland and France would provide tecl nology for the hydrocracker unit, the 6,000 MTPA capacity hydrogen plan captive power plant (IC engine) as vis-broker revamping, respectivel while Engineers India Ltd. were const tants for all process units and off-s facilities.



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RSMDC succeeds in rock phosphate blending

A shipload of high-grade rock phosphate, containing 36 per cent P_2O_5 has been imported from Togo by the Rajasthan State Mineral Development Corporation (RSMDC), for upgrading the P_2O_5 content found in the low-grade rocks of Udaipur.

The blended rock will be used for the manufacture of single super phosphate. Until RSMDC succeeded in blending the rock, fertiliser manufacturers in the country, were using only imported high-grade rock. It took RSMDC about three years to perfect the blending technology.

"Tapati" is the tenth ship to touch Bombay port carrying the high grade rock phosphate from Togo. Earlier shiploads have been successfully used in blending the two grades and the entire blended rock has been used to manufacture single super phosphate. Encouraged by the success achieved by RSMDC in perfecting the blending technology, steps are now being taken to use the blended rock in the manufacture of complex fertilisers such as urea, di-ammonium phosphate, nitrophosphate, etc. So far, only high-grade, imported rock has been used in the manufacture of these fertilisers.

RSMDC will supply samples of the blended rock to Project Development of India Ltd. (PDIL) for carrying out trials to produce a proper mix for the manufacture of "complex fertilisers". The evaluation work, however, may take some time. If RSMDC succeeds in producing a proper blend for the manufacture of "complex fertilisers" it would go a long way in saving valuable exchange.

The total reserve of low-grade rock phosphate containing P₂O₃ in the coun-

try is estimated at around 16.5 mill tonnes, which has no use whatsoever present. For upgrading the low-grance rock the Rajasthan State Mines a Minerals Ltd. (RSMM) is setting up Rs. 200-crore beneficiation plant Udaipur.

The cost involved in the manufactor of fertilisers using high grade rock quite substantial. The blending technogy developed by RSMDC is, thus considered suitable by experts. RSMDC turnover of blended rock has alreat touched the Rs. 30-crore mark. Foreit exchange to the tune of Rs. 10 cross has also been saved. To promote the upon blended rock, the Centre has all granted subsidy to the manufactures.

According to Mr. R.K. Saxer Chairman and Managing Director RSMDC, "no more trial production" now required for the manufacture single super phosphate, using the blened rock. The RSMDC was also working on the possibility of developing a proposition of imported rock from Jordan withat from Togo and the indigenous one Such a mix if developed would improve the reactivity and considerably reduction, he added.

During the current year RSMD plans to produce 1.90 lakh tonnes of blended rock. The revenue to the State exchequer would increase to Rs. 1 crores per year, if the blending was more, Mr. Saxena added.

PHARMACY WORKSHOP

Government College of Pharmacy Bangalore conducted a one day work shop on "Computer applications in pharmacy" on 10th June, 1989 at the college premises as part of its silver jubilee celebrations.

The work shop covered topics of importance such as drug design, market research, quality assurance, pharmacokinetics, trade applications, and hospital pharmacy.

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FACT chief to head HFC

After a lapse of about eight months the Government has selected Mr. N.B. Chandran, presently Chairman and Managing Director of the Fertiliser and Chemicals Travancore Ltd. (FACT) to head the crisis-ridden Hindustan Fertiliser Corporation.

The Union Agriculture Ministry has already cleared the file of Mr. Chandran's appointment as the new chairman and managing director of HFC. He is expected to assume charge soon. Meanwhile, Mr. M.L. Sharma, Director (Finance), is officiating as acting chairman and managing director of HFC since Mr. Sebastian Jacob resigned last year. It is significant to note that since 1978, when HFC came into being, the organisation had as many as nine CMDS.

It is to be noted that the situation which led or was projected as an alibi for Mr. Jacob's quitting HFC has changed a lot. The labour situation in Durgapur plant, which was very often cited by most of the past CMDS as one of the root cause of HFC's downfall, is totally a changed one. The unions are more flexible now and are in a mood to extend all possible co-operation to Mr. Chandran. This would be of great advantage.

Mere induction of a new and enterprising CMD will not change the picof an accumulated loss of Rs. 500 crores. What is of immediate importance is that the new CMD will have to push through the bureaucratic hurdles at the Government level for the long-term renovation plan entailing fresh investment of Rs. 1,000 crores. But what is causing more concern to the HFC management as well as the trade unions is the Government's total silence on the activities of Haldia fertiliser plant.

Haldia project has already had an investment to the tune of Rs. 700 crores and another Rs. 500 crores are to be required to renovate the plant, which surprisingly never produced commercially. The Government since 1986 is draining money on the administrative expenses and maintenance of this project.

A delegation of the Fertiliser Workers' Federation of India which met the Union Agriculture Minister, Mr. Bhajan Lal, on June 2 has apprised the Minister about the recommendations of the Paul Pothen committee and subsequent appointment of Haldor Topsoe to examine the techno-economical possibilities of HFC plants and Toyo of Japan and UHDE of West Germany to suggest corrective measures for Haldia project which was a victim of tied-up credits with as many as 19 countries.

Mr. N.C. Sharma, General Secre of FWFI, told the Minister that the sultancy firms have categorically sta that all plants including Haldia could made economically viable. They recommended that if modificati revamping were to be undertaken fi April 1989 all these plants would s giving dividends by 1992 and wipe the accumulated losses within a spar five-six years. The revamping plan now with the Public Investment Box It is to be noted that besides techn and design deficiencies, the HFC pla have outlived the normal life span 15-20 years and if no revival plan immediately undertaken, all these pla would invariably face a total collap The latest serious fire accident in D gapur plant is a pointer to that.

While the management is trying get through the Rs. 1000-crore reno tion plan, they are also trying to trim manpower. But the management's de sion to appoint 140 management to nees is an "anti climax" to the idea reducing the surplus manpower, s Mr. T.B. Chatterjee and Mr. S. D. Roy, secretaries of the federation. T Corporation, they said has introduce voluntary retirement scheme but surpr ingly, while methods of "almost co cion" are being applied to ease dynamic and technically sound office it has made fresh appointments fro outside at senior management level

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Now it appears that the Union Agriture Ministry has okayed the idea of ovating the existing plants and taking asures to revive the Haldia plant and mmence commercial production at earliest. The whole package is now ing with the Finance Ministry.

According to the FWFI secretaries, Union Agriculture Minister told on that his Ministry has accepted the vamping decision as a matter of principle but mentioned that financial conaints are standing in the way for its rly execution.

Efforts are on to get the required nds released. The Federation hopes at the Government would release the nds and also with the induction of a w chief executive the functioning of the management would be more effective and the industrial relations congently for productivity and growth of the ganisation.

ULK DRUGS SOON AT EDUCED PRICES

Hyderabad-based Dr. Reddy's aboratories Limited (DRL) will arket, in six months time two important bulk drugs -- 'ciprofloxacin' and alapril maleate', -- at prices much low the international level, according the founder of the unit, Dr. K. Anjieddy.

The ciprofloxacin, which is used for eatment of urinary tract, gastro intestal infections and typhoid will be produced first. The company will price at one fourth the international price, are company has started manufacturing cently 'Enalapril hypertensive drug which will be marketed to formulators the next six months.

He said the company was issuing this shares on 1:2 basis at Rs. 10 each the a premium of Rs. 15 per share, nounting to Rs. 2.04 crore. The issue, nich is opened on May 22, will close June 21.

In the 15-month period ending March 31, 1989, the company's turnover rose from Rs. 11.94 crores to Rs. 16.70 crores (annualised basis). Gross profit went up from Rs. 1.19 crores to Rs. 1.45 crores, and net profit Rs. 61.91 lakh to Rs. 78.80 lakhs.

KRIBHCO ACHIEVES RECORD CAPACITY UTILISATION OF UREA

The Krishak Bharati Cooperative Limited (Kribhco) achieved a record capacity utilisation of 117.7 per cent for urea and 115 per cent for ammonia during 1988-89. This was Kribhco's third year of commercial operations.

Addressing a press conference at New Delhi, the managing director of Kribhco, Dr. K.K.S. Chauhan, said that as the society has adopted a uniform year from this year, 1988-89 has been of nine months' duration (July 1988 to March 1989). He said that the total turnover of the society for the nine-month year was Rs. 458.71 crores as compared to Rs. 518 crores for 12 months during 1987-88. This is an increase of Rs. 91 crores over the turnover of the previous year for the same period.

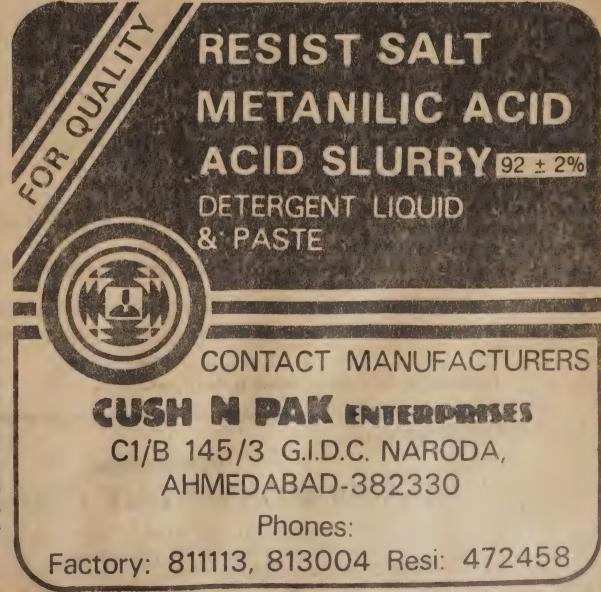
A total of 12.81 lakh tonnes of urea was despatched by Kribhco during the year. It also handled two lakh tonnes of imported DAP during the year.

69 PRIVATE COMPANIES REG-ISTERED IN MAY

Seven public and 69 private companies in Karnataka were registered with an aggregate authorised capital of about Rs. 3.18 crores and Rs. 5.56 crores, respectively, during May 1989.

PSF PRICE HIKE

The polyester staple fibre (PSF) manufacturers have decided to hike the price of their product by Rs. 5 per kg. The new selling price for PSF is Rs. 89 per kg with effect from June 1, 1989.



Bindal Agro to invest Rs. 40 crores in LDPE plant

Bindal Agro Chemicals Limited, belonging to the Oswals, is considering sizeable investments in its LDPE (low density polyethylene) unit at Rishra in Hooghly district, which it acquired from ICI India Limited (erstwhile IEL Limited) in November last.

Under the investment programme, the plan is to install a third LDPE plant for which the cost has been tentatively estimated at Rs. 40 crores. With the commissioning of the third plant, the company's total LDPE capacity is to jump to 20,000 tonnes annually from the present 12,000 tonnes. At present there are two plants, each of the capacity of 6,000 tonnes.

The country now imports about 80,000 tonnes of LDPE annually. Even with the commissioning of the third plant at Rishra, there will still be a sizeable demand-supply gap. The only other producer of LDPE in the country is the public sector Indian Petrochemicals Corporation Limited.

The Oswals made an entry into West Bengal with the acquisition of the Rishra unit which was closed for nearly two years. ICI India, to which the unit belonged, had in fact decided to scrap the unit after having failed to run it. The unit, at the time the Oswals acquired it, was virtually junk. ICI had sold it on an "as-is-where-is" basis with the stipulation that it would provide no back-up support to the buyer to run the plants.

The Oswals bought the unit for Rs. 14 crores and put in another Rs. 10 crores. The first plant, for which several debottle-necking measures were taken by the new owners, was put on a trial run in March and commercial production commenced from May 10. This plant, which has a capacity of 20 tonnes per day, is now producing more than 21 tonnes per day. The second plant, which is of the same capacity as the first one, is to start production soon.

However, the experience of all those months has not always been happy. First, there was the uncertainty over the availability of alcohol. West Bengal does not produce any industrial alcohol, the major input for making LDPE. The entire supply has to come from Uttar Pradesh. The problem has since been taken care of. The U.P. government has assured the Bindal-Agro management of adequate supply of the item. Against the annual requirement of 40 lakh litres, the company has now in hand firm commitment from the U.P. government of 30 lakh litres of supply.

Second, the company has appeal the West Bengal government for wa of sales tax, alcohol import pass fre 13 paise and octroi of five paise per The argument of the company has I that by reviving a closed unit, it helped the process of industrialisa in the state and created jobs for m Besides, industrial alcohol not be available in the state, the compan already incurring additional costs bringing it from outside. For exam the U.P. government charges pass at the rate of 50 paise per litre. It ta 2.750 litres of alcohol to make a to of LDPE, so that amount of addition cost is understandable. However, reply of the West Bengal governm is still awaited.

Finally, what is causing concern the management is the persist demand for jobs by local people. The are many political parties in the a where the unit is located and, ag within each party, too many faction Each faction from time to time launce an agitation in front of the factory g and gherao the senior officials demanding jobs for its own people.

The management has so far tried accommodate the demand as far as posible. But then it cannot satisfy all. I district administration too has tried best to cope with the situation. But the there is a limit to which it can go.

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Policy to cut imports under review

ne Union Government is reviewing arlier decision to effect major cuts aports this year following dramatic overnents in the external trade bal-

t present, it is planning to have or savings by reducing import of tronic kits and cutting inventories the industry. The liberalisation polsinitiated earlier will, however, not eversed. A drive to push exports by e industrial houses will also be ched.

he Commerce Ministry had earlier orted that in March, exports had regred a steep increase and the 1988-89 notal year might end up with a ord 29 per cent.

further, in the first quarter of the curfinancial year, the steep rise of rly 24 per cent in imports registered year has been arrested, according to visional figures.

erves continued to fall in the first reter of this year, falling by as much Rs. 1,074 crores from March 31 to 5, the assessment in the Government not is that the arresting of incream imports noticed during this period have a favourable impact on the exage reserves in the coming months.

is now analysed that the steep ease in imports last year was not due arious liberalisation policies of the rernment but was mainly due to the factors.

he impact of drought in the precig two years continued to be felt on
ier imports of cereals which alone
iunted for Rs. 561 crores in 1988-89
pared to almost nil imports in the
rious year. The import of foodgrains
made to augment the depleting
iks. The second contributing factor
higher import of fertilisers as a
ilt of a dramatic pick-up in demand

following a good monsoon last year. Fertiliser imports in 1988-89 increased by as much as 90 per cent over the previous year and accounted for Rs. 922 crores.

More than half of the fertilisers imported were in the finished form indicating the urgency to meet the sudden spurt in demand in spite of there being much unutilised capacity in the fertiliser industry.

The third factor being cited for increased imports last year is the steep increase in the prices of non-ferrous metals and steel items. The imports of these two items had risen by as much as 61.5 and 52.6% respectively and accounted for as much as Rs. 924 crores.

These bulk items together at Rs. 4,100 crores accounted for 80 per cent of the total increase of Rs. 5,350 crores in imports in 1988-89 over the previous year. They had increased by 88

per cent from Rs. 2,179 crores in 1987-88.

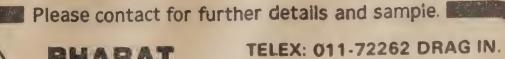
The present thinking in the Government, therefore, is that the liberalisation of import licensing policy is not much to do with the deterioration in the balance of payments. There are two strong lobbies in the Government, one advocating stiff cuts in the imports to correct the trade balance and another group which is supported by influential members in the Planning Commission arguing against any reversal of the earlier policy. The latest review indicates that the view held by the latter group is being vindicated.

CZECH AWARD FOR C.N.R. RAO

The Czechoslovakian Academy of Sciences has awarded its most prestigious "Hevrovsky" gold medal to Professor C.N.R. Rao, Director, Indian Institute of Science (IISC), Bangalore in recognition of his contributions to chemical sciences.



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Nylon yarn import mooted

Import of nylon yarn has been recommended by the Textile Commissioner, Mr. Arun Kumar, with a view to bring down its prices to reasonable levels.

He has expressed concern over the sky rocketing prices of nylon yarn as also failure on the part of spinners to control the activities of their dealers who are allegedly indulging in price manipulations.

At the meeting of the Price Monitoring Committee on synthetic fibres, filaments and fabrics held in Bombay on June 3, Mr. Arun Kumar reminded the nylon yarn spinners of their promise that "if the government gives duty concessions, we will pass on the benefit to the consumers and that government will also not lose revenue". He stated that the spinners now can not absolve themselves by staying that "rise in market prices is beyond their power".

The textile commissioner felt that the so called price agreement between spinners and Surat art silk weavers is not

king to the satisfaction of weavers eneral and "imports needs to be restored to if indigenous production is short".

A spokesman for Association of Synthetic Fibre Industry (ASFI) representing spinners, stated that the prevailing nylon yarn situation has arisen as a result of shortage of supply created by lower production in one of the units affected by labour problem. He informed the weavers that the price agreement with weavers applies to entire production and not only to 10 per cent of supplies made to Surat cooperatives.

Dr. Mohan Piramal, representing the organised textile industry, stated that mills are losing heavily as a result of high prices of blended yarn, PSF and PFY/POY. The PSF manufacturers said they were also losing. Both blamed the

present situation to the high prices of raw materials for polyester. The textile commissioner, however, made it very clear that though mills had received supplies at lower prices last year and the mills representative had stated that the benefit of lower raw material prices would take about 3-4 months to reach consumer level, "it has not been received by the consumer so far".

ACRYLIC FIBRE PLANT: S.P. OSWAL SEEKING FOREIGN TIE-UP

Ludhiana-based S.P. Oswal is exploring the possibility of setting up a Rs. 150-crore acrylic fibre project in collaboration with Du Pont, the US chemical conglomerate. Snia Spa of Italy and American Cynamide are also being considered for the project.

Mr. Oswal has signed a memorandum of understanding with the UP State Industrial Development Corporation (UPSIDC) for the joint sector project, which will have a capacity of 15,000 tonnes per annum.

Mr. Oswal's units, Vardhaman and Mahavir Spinning, can utilise as much as 60 per cent of the acrylic fibre production in-house. Both the companies have a capacity of 1.5-lakh spindles. Out of this, one lakh spindles are in the Hosiarpur and Maler Kotla units of Mahavir and another 50,000 spindles are in Ludhiana.

A substantial chunk of spinning capacity used acrylic fibre as a blending material with cotton. Acrylic serves as a substitute for wool and has good mixing and dying qualities. Mr. Oswal is also one of the contenders for the 12,000-tonne-per-annum acrylic fibre project in Himachal Pradesh. Among the other contenders for the Himachal unit are the Singhanias, Modis, and Mr. K.L. Jain of Arihant Fabrics.

The Himachal project was original supposed to have been implement the Thapars in collaboration with Pont. But the Thapars' proposaturned down by the Union govern because it entailed import of shand machinery older than what stipulated.

The Thapars decided against proing with the project with new of ment as the cost of the project then have shot up to Rs. 140 croprice at which they thought the p to be unviable. The new bidders ously do not share that concern.

The Oswal group's turnover is a Rs. 250 crores from Vardhamar Mahavir Spinning. Both the comphave attractive cash flow posi Besides, Mahavir, has a reserves of Rs. 24 crores on a capital of Rs crores while Vardhaman has an e of Rs. 3 crores and reserves at a gering Rs. 26 crores.

Mr. Oswal has expansion and disification plans totalling Rs. 100 c in these units. These plans include ting up a 100 per cent export oric cotton spinning units in Manideep Bhopal with a capacity of 12,000 dles, and capacity expansion in its divisions. These plans are to be final almost entirely from internal account and term loans.

PERSONALITIES

- * Mr. S.V. Lathia, Chairman-or Managing Director of Lathia Ru Manufacturing Company Private I ited, has been elected as Presider Association of Merchants and Manuturers of Textile Stores and Machin (India).
- * Mr. C.B. Chandorkar, Der Director, General, has taken charg Regional Chief of Bureau of Ind Standards (Formerly Indian Stand Institution), Western Region.

olymer price crash not beneficial to India

n a major upheaval, prices of all rmoplastics have crashed in the emational market. The hapless Indian cessor, however, continues to pay ord prices for this raw material with sign of any relief.

Some Indian PVC manufacturers, on other hand, are said to be lobbying raising the import duty to prevent low of cheaper material, which may be them to reduce prices. This could to be confirmed with PVC producers, to independent observers say that any ward revision of duty at this juncture II not be in the larger interests of the astics industry. The fall in internatinal prices has been neutralised to me extent by hardening of the dollar, is pointed out.

When low density polyethylene DPE) has plunged to \$845 a tonne road, the material is in short supply the Indian market, commanding a emium of Rs. 7 to 8 a kg. Against dian Petrochemicals Corporation Ltd. PCL) official pooled price of Rs. 31 kg, LDPE is selling at Rs. 38 a kg in a Bombay market. Even at this price, a material is in short supply.

Processors blame IPCL and the price toling system for the situation. IPCL's tranglehold' of the LDPE market is spected to tighten once the Nagothane implex goes on stream. Some proces-

sors fear that import duty on LDPE may also be manipulated to favour the public sector corporation.

Exactly a year ago, a high-level delegation consisting of polymer producers and Government officials had trudged through Europe and America in a sourcing mission to locate manufacturers with surpluses. Prices were ruling at a high of \$1,300 to 1,600. \$1,300 for PVC, \$1,400 for polypropylene, \$1,500 for high density polyethylene and \$1,600 for low density polyethylene. Even at these prices, the material was scarce. Suppliers were not too keen on sporadic buyers like India. It was even feared that prices in the spot market will climb up to the \$2,000 level.

Prices of all plastics have now fallen below the \$1,000-level. The prevailing prices are approximately \$790 for PVC, \$845 for LDPE, \$850 for HDPE, \$850-900 for PP and \$900 for polystyrene. The downtrend was precipitated by China's withdrawal from last Fall Fair which left traders with huge inventories, leading to price undercutting. Spot prices ultimately fell below the manufacturers' prices forcing them to cut prices too.

By the second half of next year, sizeable quantities of HDPE, LDPE, LLDPE and PVC would become available from the Maharashtra Gas Cracker Complex (MGCC) and Reliance Petrochemicals Hazira plant, the IPCL chief, Mr. Hasmukh Shah, told a gathering of processors at Bombay.

He said the government had sanctioned additional 75,000 tpa capacity of HDPE and another 25,000 tpa of HDPE/LLDPE at Nagothane based on the additional one lakh tonne ethylene capacity that has been cleared. MGCC will be commissioned in December, he said.

While polymer producers have reported good results for the preceding financial year, the capacity utilisation of many processing units are at uneconomic levels due to high prices of inputs and consumer resistance to higher prices for end products. For the first time, consumption growth rate registered a marginal fall for some plastics last year.

If the Vizag and Auraiya crackers and their downstream units go on stream by 1995-96 as planned, and polymer consumption grows at an average of 15 per cent, supply will outstrip demand, Mr. Shah said.

Demand for plastics is largely supply-driven and there is every possibility that consumption growth can spurt with easier availability. The prospect of open competition among producers leading to a buyers' market for polymers in mid-1990s looks too good to be true at this juncture.

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'Times' synthetic rubber project

The Maharashtra Chief Minister, Mr. Sharad Pawar has written to the Union Industry Minister, Mr. J. Vengala Rao, requesting him to allot a letter of intent in favour of Bennet Coleman & Company Ltd., publishers of 'Times of India', for setting up a synthetic rubber project in the State. In return, Maharashtra Petrochemicals Ltd. (MPCL), a State Government undertaking, is willing to surrender its two letters of intent to set up synthetic rubber projects.

MPCL has been holding on to its letters of intent for setting up synthetic rubber projects costing about Rs. 450 crores. It had earlier identified Century Textile and Industries Ltd. (CTIL) as a co-promoter. CTIL had offered to set up the project entirely through its own resources without any financial burden on MPCL. In other words, there would be no financial burden on the State exchequer. In view of this offer, MPCL had expressed its willingness to withdraw from the project altogether if

CTIL managed to secure a letter of intent for setting up the project in Maharashtra. CTIL concurred with the plan and efforts were on this direction until the 'Times' group appeared on the scene.

BCCL had already announced its petrochemical ambitions by bidding for projects to manufacture high volume chemicals like alpha olefines, high and linear low density polyethylene as downstream units of the proposed gas cracker to be set up in Auraiya in Etawah district of Uttar Pradesh. The cracker itself is awaiting final clearance and downstream projects cannot come up before mid-1990s.

In April, the 'Times' group applied for five petrochemical projects costing Rs. 362 crores in Raigad in the State. The list consists of 60,000 tpa of styrene butadiene rubber, 70,000 tpa of methyl tertiary butyl ether, 12,000 tpa of butene-1, 5,000 tpa of petroleum

resins and 35,000 tpa of propylene merchant sale. Feedstock for project such magnitude is not currently available in the area, nor is it likely to available in the immediate future.

Both styrene and butadiene are short supply in the country. In fact, S thetics and Chemicals Ltd., the lead manufacturer of SBR in the coun imports substantial quantities of budiene.

For this reason, as well as possion objections from other parties, 'Times' proposal could have been so down. It made sense to appropriate letter of intent already granted to some one else.

Once Bennet Coleman & Co. enter the fray, MPCL and the State Gove ment began favouring the former a cold-shouldering CTIL. At a meeticalled by the Secretary, Department Chemicals and Petrochemicals March 7, MPCL's Chairman a Managing Director made a strong plato grant the letter of intent in BCCI favour.

Mr. Pawar's letter No. CMS/FS/19
10 (14)/Ind-12 dated March 23 state
"The Ministry of Industry, Departme
of Chemicals and Petrochemicals, h
sought the views of the State Gover
ment in the matter of granting a lett
of intent for this project to a party fro
the private sector.

These have already been communicated to the Department of Chemica and Petrochemicals vide our letter N PSP-1088/9837/IND-12 of 3rd Marc 1989. The letter is silent on why the 'Times' group has been preferred CTIL.

Mr. Pawar concludes his letter saying: "I would, therefore, request you to kindly consider the views of the State Government favourably and grant the letter of intent on priority to Benne Coleman and Co. Ltd."

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7. Mannitol USP Pyrogen Free	Brazil	25 kgs.
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9. Atropine Methylnitrate IP/BP	West	100 ame
10. Homatropine Hydrobromide IP/BP	German	100 gms.
11. Homatropine Methylbromide	German	eacii

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MMTC, STC sign MoUs

the State Trading Corporation (STC) the Minerals and Metals Trading poration (MMTC), while commitfor higher exports and efficient ort operations in 1989-90, have ed the government to ensure timely ase of foreign exchange and available of other inputs.

the two major trading corporations and memoranda of understanding bUs) on June 5, with the commerce retary, Mr. A.N. Verma, Mr. Bhuper Singh, chairman-cum-managing actor of STC, and Mr. I.P. Hazarika, ID of MMTC, signed on behalf of a enterprises.

The MMTC plan includes carrying preparatory work relating to the pening of Paradip port, the Vizager harbour and the proposed joint ture for mining of muriate of potash Canada and establishment of an cort-development fund to finance erseas market surveys.

TC will endeavour to maximise ports from the rupee payment areas PA). In addition to importing 100 per et of the quantities offered by them eer trade plan provisions for its items, will import canalised and OGL items and at Rs. 30 crore, from the RPA, elect to import of projected quantities. It will venture into import of OGL as with the object of using its bulk ling power and importing at competing prices.

the import turnover of MMTC ong 1989-90 would be Rs. 2,975.50 as as against Rs. 2,910.61 crores in 3-89. STC's imports are projected round Rs. 1,460 crores compared Rs. 2,036 crores in 1988-89, the acted decline being mainly due to arp decline in edible oil imports.

MTC has sought permission for ing an office in Antwerp and due ideration of the corporation's pro
I that minerals and ores be made

eligible for income tax exemption under Section 80 HHC.

IPCL TIE-UP WITH YUGOSLA-VIAN COMPANY IN R & D

The Indian Petrochemicals Ltd. (IPCL) and the Industrial Nafte (INA) of Yugoslavia has signed an agreement for co-operation in research and development in petrochemicals and also in offering services within the Third World markets.

Under the agreement, the IPCL will market the products of INA and the INA will reciprocate by promoting IPCL products in Yugoslavia market.

An IPCL spokesman said that the IPCL had also entered the long-term agreement for supply of 15,000 tonnes of LDPE during 1989-90 which help in easing the supply position for LDPE in the Indian market.

An important part of the Indo-Yugoslavia dialogue in the recent months was the proposal to create a forum for petrochemical producers from developing countries.

NEW DRUG UNIT FOR MANIPUR

The drug industry is entering the north eastern region for the first time with the setting up of a joint venture formulation unit in Manipur by the State Government and the public sector Hindustan Antibiotics Limited.

The unit, to cost about Rs. 2.5 crore, will cater not only to the needs of Manipur but also other states of the region, according to an official release.

The foundation stone of the unit was laid near Imphal at a function on June 5, in which the Chief Minister, Mr. R.K. Jaichandra Singh and Mr. M.S. Gill, Secretary, Department of Chemicals and Petrochemicals, participated.

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Fall in coal supplies

A sudden drop in coal supplies to industries in Tamil Nadu in the month just gone by has virtually gone unnoticed, with the apparently-affected units making no hue and cry.

While the extent of shortage is not immediately known, the affected units do not seem to have worried at all, thanks to the 60 per cent power cut taking the wind out of their sails, these units may have so wound down their activities as not to have felt the temporary coal shortage, say sources.

The downturn in industrial grade coal arrivals in Tamil Nadu in May was occasioned by the Centre's ad hoc decision to ask Coal India Ltd. (CIL) to feed the National Thermal Power Corporation's Ramagundam station.

The ad hoc coal diversion to the Ramagundam superthermal powerhouse was in turn triggered by the prolonged strike, since called off, at the Singareni collieries which is linked by its pithead to Ramagundam station. The actual extent of such coal diversion to Ramagundam is not readily known here, but there are expectations that the CIL's industrial-grade coal supplies to Tamil Nadu should be back to normality soon.

Currently, the monthly coal offtake by industries, as distinct from power plants, in Tamil Nadu and Pondicherry is of the order of 1.35 lakh tonnes. On the other hand, CIL's coal linkages to power plants in Tamil Nadu amount to a total of over six lakh tonnes per month. These supplies to the powerhouses were not, however, affected when a sudden drop in CIL's supplies of industrial-grade coal came to pass.

DAE INITIATES STEPS TO SET UP 500 MW REACTORS

The Department of Atomic Energy (DAE) will procure major equipment

from the public and private sector to up high-powered 500 mw atomic re tors. DAE has initiated action on and for acquiring land required for ious projects under the atomic podevelopment programme, official so ces said.

The secretary, DAE, Dr. M.R. anivasan and secretary, ministry of parameter implementation, Dr. P.K. Be jontly reviewed the projects of the Deat a high level meeting in Bombrecently. The review brought out to DAE has been able to reduce the trace required for commissioning of 235 mereactors from nine years to about 7-years, benefiting from the experience gained by experts of the department setting up projects.

DAE has also drawn up the heat water production programme to mather requirement of the nuclear power programme. These projects, it was vealed, are making good progress. That heavy water project in Maharash completed at a cost lower than approximas commissioned on schedule. At review, Dr. Srinivasan and Dr. Baalso identified various action points the projects under implementation.

INDIAN OXYGEN WINS TURK ISH CO ORDER

Indian Oxygen Limited (IOL) I secured orders from Indian Petrochelicals Corporation Limited (IPCL) a Birlesik Oksijen Sanayi (BOS), Turke a British, Oxygen group company, af competing successfully with sever international firms.

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ONGC to develop Neelam field

The Oil and Natural Gas Commission NGC) has finalised a scheme for the velopment of its Neelam field in stem offshore at an estimated cost of out Rs. 1,583 crores.

The Neelam field located about 45 n, south west of Bombay, comprises two oil-bearing offshore structures, rlier designated as B-131 and B-132 nucture in June 1987. The delineation alling of the two projects has shown at they are part of a larger structure, nich has now been named as Neelam.

The field covers an area of 86 sq. km. d is estimated to have geological serves amounting to 149.90 million anes. This has now emerged as a gior offshore field, and in fact, the lk of the production increase in the ghth Plan is anticipated to come from 3. It is estimated to have a production tential of producing four million anes per annum, with a possibility of ducing six million tonnes per annum.

As per the development plan the folwing facilities have been envisaged I oil well platforms, two major injecn well platforms, drilling of 98 wells, rocess complex consisting of oil/gas cess platform, living quarters and a ure gas lift platform, well fluid flow s, water injection and gas-lift lines, and gas feeder lines and modificaat Uran.

The western offshore has 303 process of which 117 have so far been led. Over the years, the total oil cryes in western offshore have reased from 512 million tonnes (as January 1, 1975) to 2323.4 million ries (as on January 1, 1989).

imilarly, the gas reserves have also orded an over 10-fold increase. The reserves have increased from a agre 78 billion cubic metres (as on pary 1, 1975) to 145.2 billion cubic tres (as on January 1, 1989). 30 new toveries have been made in western

offshore since 1980, comprising 23 oil and gas and seven gas discoveries.

There has been several-fold acceleration in offshore operations since the beginning of the Sixth Plan, and a further two-fold acceleration of activities is contemplated during the Seventh Plan as compared to the Sixth Plan. As against seven rigs deployed in offshore during 1980-81, 30 rigs comprising nine owned and 21 charter hired are presently in operation.

Besides drilling rigs, ONGC's offshore fleet comprises seismic survey vessels, multi-purpose support vessels and a large number of offshore supply vessels.

During the Eighth Plan, about seven million tonnes increase in production is expected from western offshore. The entire increase would come from fields other than Bombay High.

From a present production level of about 20 million tonnes per annum, the production by the end of the next Plan (1994-95) is expected to be over 27 million tonnes. Another significant feature would be the reduction in the share of Bombay High.

ONGC SIGNS MOU WITH GOVERNMENT

The Union government has agreed to process applications for petroleum exploration licences from Oil and Natural Gas Commission (ONGC) within 60 days of their submission. (For earlier news see p.64).

This agreement was reached between the petroleum and natural gas ministry and ONGC as part of a memorandum of understanding (MoU) signed by the petroleum secretary, Mr. H.K. Khan, and the ONGC chairman, Col. S.P. Wahi, at New Delhi on June 1. Under the MoU, the government would also

clear ONGC's foreign exchange proposals within 15 days if the investment limit is between Rs. 1 and 5 crores and within 21 days if it is beyond Rs. 5 crores.

The government has decided to clear investment proposals pertaining to South Bassein gas field, Panna field, R-series, natural gas liquid (NGL) fractionation plant, mid-south Tapti and western offshore integrated development plan.

As regards other projects, the government would clear them within 90 days of their submission. These projects include the Neelam field development, B-57 development Phase-II, L-II reservoir of Bombay High, Gandhar phase-II, Godavari gas development and Ravva development.

The government has also agreed to consider ONGC's request for reimbursing the losses incurred on its foreign borrowings. These losses are incurred on account of exchange rate-fluctuations and losses on interest in public deposits due to a difference in interest rates.

It has agreed to assist ONGC in recovering dues from various state governments and other public sector customers, if the bills are outstanding for more than two months.

The petroleum ministry will take up with the government the enhancement of ONGC's powers for new investments, expenditure on replacement and renewal of assets and on foreign exchange releases.

The Memorandum of Understanding, which lists out the various performance targets for Oil and Natural Gas Commission in 1989-90, also includes an ONGC proposal for setting up an empowered committee which would expedite clearance of projects in the petroleum sector in view of the need for setting up additional capacities on schedule during the Eighth Plan.

90 days clearance for ONGC projects

The Union government has decided to approve all projects of Oil and Natural Gas Commission (ONGC) within 90 days of the submission of the details of the projects to the petroleum and natural gas ministry.

The decision has been taken to ensure that no delay takes place in clearance of oil exploration projects and the target of indigenous oil production in the coming years is met.

According to official sources, the memorandum of understanding, to be signed soon between the petroleum and natural gas ministry and ONGC, would include a specific clause pertaining to this decision. In the proposed memorandum, the ministry is understood to have committed to ONGC to approving its projects within three months of their submission.

As of now, no time limit is imposed on clearance of ONGC projects. Consequently, several projects get delayed as their detailed project reports gather dust in the cupboards of petroleum and natural gas ministry.

For instance, the Panna Oilfield Development Project was cleared by the Union cabinet about two years after the submission of the project report to the ministry. The Western Offshore Integrated Development is yet to get the final nod of approval, although more than a year has lapsed since the proposal was sent to the ministry.

Official sources, however, point out that although the ministry does take time in scrutinising the project proposals, the delay cannot be entirely attributed to it. Much of the delay takes place at the time of the proposals consideration by the Public Investment Board (PIB) which is an inter-ministerial body.

Even the Planning Commission's objections to a proposal can cause inordinate delay in clearance of a project,

sources say. For instance, the delay in clearance of the Panna Project was mainly on account of some clarifications sought by the Planning Commission. This objection delayed its clearance by about a year, sources say.

In view of these considerations, the petroleum and natural gas ministry will now take upon itself the responsibility of getting the ONGC proposals expeditiously cleared by the Planning Commission, PIB and the cabinet. The difference now would be that the ministry would be bound by its commitment to get the project cleared, unlike in the past.

The ministry has also informally waived the requirement of two stage clearance of ONGC projects by PIB. According to the rules, any public sector project has to be examined by PIB at two stages. The first stage is before the detailed project report is prepared. PIB gives the green signal to ONGC or the public sector company to prepare the project report. The second stage clearance is given after this report is examined by PIB.

ONGC now jumps the first stage and submits the detailed project report to PIB. The ministry also does not insist on the first stage clearance, apparently in view of the fact this would be unnecessarily time consuming.

The ministry's concern at early clearance of these projects can be gauged from the fact that ONGC would play a crucial role in raising the country's crude oil and gas production during the Eighth Plan. In 1989-90, ONGC's production target for crude oil and natural gas is 31.61 million tonnes and 8636 million cubic metres.

INDIA, CHINA PETROCHEM TIE-UP

India and China have joined hands to promote mutual co-operation in the pet-

rochemicals sector. While China offered to supply technology for sty blocked butadiene rubber, India poses to export linear alkyl ber (LAB), acrylates, catalysts and mular sieves to that country.

The Indian Petrochemicals Cortion Ltd. (IPCL) and its counterpart China, Sinopec, are expected to exthe possibilities of promoting other's products in their respectountries, on a reciprocal basis. It wise, the two countries propose exchange visits of experts and far on a reciprocal basis.

India will help in promoting of lining and drip irrigation in China, with that country will assist in green he and mulching. The idea is to give a to the plasticulture programme be broadening Sino-Indian relat according to official sources.

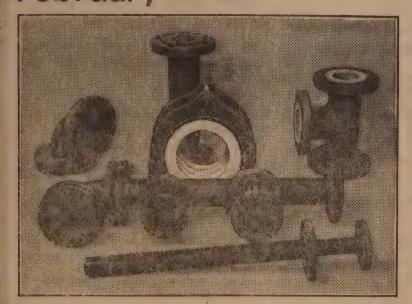
In addition, the two countries shown interest in promoting petroclical units in third countries. This posal, however, is only at a preliminate stage. These developments come is wake of a high level official delegate that had visited China a few days

MRL FIRE CAUSED BY CHOCKED PIPELINE

The fire in the old refinery of Madras Refineries Limited on Ma was caused by the sudden gushing of naphtha from a chocked pipelin the platformer unit which came contact with some ignition source, cials said. Three employees were k in the fire, which was put out in 15 mutes. The units were being prepared start up after regeneration of cataly when the mishap occurred.

There would be no shortage of refinery product because of the mis officials said. How the line got choo and the leak occurred were under in tigation, they said.

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Japanese venture into petrochemicals mooted

Japan should plan to set up production facilities in chemicals and petrochemicals in India with buy-back arrangements, according to the India-Japan Business Co-operation Committee (IJBCC).

In a backgrounder prepared by IJBCC for the forthcoming India-Japan standing committee meeting, it has been stated that such production facilities should be set up because Japan is a large importer of chemical products. Also, Japan which is faced with a massive trade surplus, is restructuring its industry and boosting domestic demand.

Similarly, under its restructuring plan, Japan in moving towards technologically sophisticated and profitable lines, while vacating areas like dyestuffs and dye intermediaries, the manufacture of which can be taken up by India.

This apart, it is also stated that Japan has access to petrochemical raw materials from all over the world which could be supplied to Indian manufacturers for production and finally for exports either to Japan or to third countries.

Japanese technology, the backgrounder states, would be particularly welcome for chemicals such as melamine and isobutylene based MMA/PMMA chemicals. There is also a great potential for exploitation of fermentation technology, in which Japan is the leader.

This is because India is endowed with the basic raw materials for this particular line of activity. The various pharmaceuticals based on fermentation technology could be re-exported not only to Japan but to other countries as well.

Other areas of co-operation listed in the backgrounder are business machines including typewriters, plain paper copiers, computers and computer peripherals and household appliances.

According to the backgrounder, two-way trade between India and Japan has gone up from \$3,487 million in 1987 to \$3,886 million in 1988, registering an increase of 11.4 per cent (in dollar terms) compared to 2.7 per cent in 1987.

India's exports from Japan have grown up by 17.9 per cent in 1988 (from \$1,530 million in 1987 to \$1,804 million in 1988). Consequently, imports from Japan have increased from \$1,957 million in 1987 to \$2,082 million in 1988.

In terms of yen, the total trade, however, declined by 2.7% in 1988 as compared to a decline of 11.6% in 1987. In absolute terms, the trade turnover came down from yen 512 billion in 1987 to yen 498 billion in 1988.

The backgrounder further states that business from the two countries would endeavour to draw up ways and means to boost the two-way trade and economic co-operation, at the forthcoming meeting.

The Indian side will be led by Mr. R.P. Goenka and the Japanese side by Mr. Saburo Aoiki, chairman of the respective sides. Other important personalities who would attend the meeting from the Indian side are Mr. Raunaq Singh, Mr. L.M. Thapar, Mr. Binay Kumar and Mr. M.H. Mody.

The paper also states that a large number of items from India acquired greater acceptability in the Japanese market during 1988. These include, chemicals (31.8 per cent), diamonds (55.1 per cent), textiles, including garments (60.9 per cent), machinery and equipment (19.96 per cent). All these are in the list of items with positive

growth. However, a few items from India have also registered a negative export growth. These include, for stuffs (7.2 per cent), textile material (54.9 per cent) and mineral fuels (54.9 per cent).

OPEC PANEL TALKS

OPEC's ministerial monitors committee was set to resume ta shortly, after a day of private talks, de egate sources said.

The committee is expected to continue talks on a Saudi Arabian proposal to abolish OPEC's \$18 per bar target price, and any other proposals that are put forward, the delegates said.

No decisions were announced af the monitoring panel's two-hour so sion. The ministers heard several repofrom marketing analysts on production quota adherence and prices during to first half of the year, delegates said the end of the meeting.

ONGC ALLOTS RS. 43 CRORE FOR PROTECTING ENVIRON-MENT

The ONGC, western region, he alloted Rs. 4 crores for environment protection plan in the Gandhar oil file of Broach district, of which Rs. 2 lakhs had already been spent in the regard.

The ONGC, under the guidelines of the National Environmental Engineering Institute (NEERSO), Nagpur are the Central Pollution Board, would be undertaking various schemes for improving the environment, an ONG release said.

Similar studies are underway in the north Gujarat oil fields where the ONGC is taking various steps not on to protect the environment, but also improve the ecological balance.

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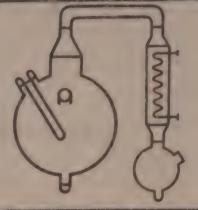
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ace-lift plans for Panna oilfield, Digboi

ne Union cabinet has approved two or projects in the petroleum sector e Panna oilfield development procosting over Rs. 640 crores and emisation of Digboi refinery at a of Rs. 131 crores.

the Panna oilfield will be developed the Oil and Natural Gas Commission (GC) and the modernisation of the poil refinery will be undertaken by an Oil Corporation (IOC). Both the ects were cleared by the Public estment Board (PIB) about five this ago.

the clearance by the cabinet comce on economic affairs at its meettheld at New Delhi recently means work on the two projects could start deciately.

ccording to official sources, the a field will produce about 5.92 lakh es of oil in the first year of the proThe peak production of oil and gas this project would be 1.2 million es per annum and 3.57 million metres per day, respectively.

n of one process platform, eight orms and drilling of 65 wells. The ess platform complex at Panna will facilities for processing oil and ciated gas, handling of gas, transtion and for living accomodation. lines from various well platforms process platform would also be

n of wells will be planned along addition of surface facilities. The a field in the western offshore area ated about 95 kilometres north-of Bombay, lying mid-way cen the Bombay High field and Day city. Its estimated geological arces potential is 85 million tonnes.

e clearance of the project has been ed by almost a year-and-a-half. It was taken up for consideration by PIB in February 1988. But its clearance was kept in abeyance till clarifications sought by the Planning Commission and the petroleum ministry were provided by ONGC. The clarifications, which would have helped in a better evaluation of the project, were provided to PIB in November 1988. These were considered and subsequently the clearance was given. No special meeting was convened for it and the approval was given on the files.

The modernisation of the Digboi refinery, believed to be one of the world's oldest such plants, would result in a marginal increase in the refinery's throughput from the existing 0.5 million tonnes to 0.6 million tonnes.

More significantly, the face-lift plan for Digboi refinery would envisage renovation of all the facilities at the refinery, which have been in use for about 86 years. The refinery in Assam was set up in 1902. And all the facilities are overaged requiring replacement and renovation.

The detailed project report, prepared by IOC, had also envisaged increased output of light diesel oil (LDO) from the refinery. This called for an additional investment of Rs. 35 crores. But a scrutiny of the report showed that the demand in the north-east for liquid fuel is more than that for LDO. This is because the new power projects to be set up in Assam and other north-eastern states would require more liquid fuel. Thus the project report was modified to create facilities for increasing the output of liquid fuel. As a result, the additional investment of Rs. 35 crores was not cleared.

The Digboi refinery is one of the 12 oil refineries in the country. The total installed capacity in these refineries is estimated at 48 million tonnes. In addition, the country has a swing capacity of two million tonnes per annum in

Hindustan Petroleum Corporation Limited's Bombay refinery.

Two more refineries are now being set up — one at Karnal with a capacity of six million tonnes and another at Mangalore with a capacity of three million tonnes per annum. There are plans to set up about three more refineries in the Eighth Plan.

DUTY DRAWBACK RATES IMPROVED FOR 126 ITEMS

The government has announced improved rates of duty drawback industries to neutralise increases in their rates of duty and international prices. The revised duty drawback rates, which came into effect from June 1, were announced by Mr. B.V. Kumar, member of the Central Board of Excise and Customs.

Mr. Kumar said that while for 70 products there has been no change in the duty drawback rates, for 20 products there has been a marginal reduction in the rates.

For seven items, which earlier had duty drawback rates, no fresh rates have been announced for want of data. These items include reclaimed rubber, tanned hides and skins. Some of these items, however, are covered under the International Price Reimbursement Scheme (IPRS).

Of the 126 items for which duty drawback rates have been improved 52 items will get more than 20 per cent. The outflow on account of duty drawback in 1984-85 was Rs. 238.29 crores, in 1985-86 Rs. 268 crores, 1986-87 Rs. 336.28 crores, 1987-88 Rs. 420 crores, 1988-89 Rs. 500 crores and in the current year this is expected to touch Rs. 600 crores.

Mr. Kumar said that the increased outflow is both on account of increase in exports and also due to increase in duties.

ENVIRONMENT

Ozone depletion will cause global climatic warming

The ozone layer, one of the earth's most important life support system, is at serious risk. Ozone, a triatomic form of oxygen is found largely in the stratosphere, a region of the atmosphere that extends from about 8 km at the poles and 17 km at the equator to about 50 km above the earth's surface. This crucial element constitutes less than one part per million of the gases in the atmosphere — if compressed to the earth's surface it would only be three millimetres thick.

A molecule of ozone (O₃) is created when ultraviolet light strikes an oxygen molecule (O₂). A photon splits the oxygen molecule into two highly reactive oxygen atoms (O). These quickly combine with intact oxygen molecules to form ozone (O₃). The gas readily absorbs ultraviolet light and dissociates into its component parts (O₂ and O). These cycles recur. Given constant conditions, the net result is that ozone settles into a dynamic steady state, in which the rate of its formation is equal to the rate of its removal.

Ozone absorbs most of the ultraviolet rays from the sun, preventing them from reaching the earth. Solar ultraviolet radiation is composed of mainly UV-A and UV-B, categories based on wavelengths. The shorter wavelength radiation, UV-B is the more biologically injurious component of sunlight.

Such radiation is energetic enough to break apart important biological molecules, including DNA leading to an array of problems. It causes sunburn, skin cancer, cataracts and can suppress the immune system. Evidence indicates a one per cent decline in the ozone layer could lead to four-six per cent increase in the incidence of some skin cancers.

The Australian death rate from skin cancer is now five times greater than 50

years ago. Raised levels of UV-B radiation could result in reduced global crop production and it is apparent that one per cent increase in UV levels could lead to one per cent decline in crop productivity. It could severely damage the oceanic food chains by the destruction of phytoplanktons, leading to a reduction in oxygen output. So the shock waves from such a major ecological disturbance would directly affect the life and welfare of human societies.

Although the drastic thinning of the ozone layer (the greatly thinned ozone layer is colloquially known as "ozone hole") apparently began around 1976, it was in May 1985, that the atmospheric scientists of the British Antarctic Survey at Cambridge published a completely unexpected finding. They found the springtime amounts of ozone in the atmosphere over Halley Bay in Antarctica had decreased by more than 40 per cent between 1977 and 1984. Not only that, the ozone over Antarctica decreased dramatically September-October and then gradually replenished itself by the end of November.

In September, 1987, the ozone reached its lowest recorded level ever and the decline lasted upto December. Recently, ozone depletion has been detected in Arctic. More alarmingly, recent data indicates that ozone depletion is occurring on a global scale, although nowhere as extensively as over the Antarctica. At its maximum, the Antarctic "hole" was the size of the United States.

There are two common explanations for the ozone hole. One theory assumes that pollutants are the cause; the other emphasises a natural shift in the air movements that transport ozone-rich air into the polar stratosphere. Among the pollutants, chlorofluorocarbons (CFCs)

are the main culprits. Once hail miracle compounds, these were introduced some 60 years ago an used as coolants for refrigerator air-conditioners, propellant for ac sprays, agents for producing foam cleansers for electronic parts.

CFCs are highly stable and un tive compounds thus non-toxic is lower atmosphere (troposphere). I ever on rising into the stratosphere are broken down by ultraviolet radi releasing chlorine. This chlorine, in reduces the amount of ozone. Wh chlorine atom (CI) collides wit ozone molecule, the chlorine steal ozone's third oxygen atom formi chlorine monoxide radical (ClO) ar oxygen molecule. This cycle contin Consequently, each chlorine atom destroy as many as 100,000 ozone ecules before it is inactivated or retu to the troposphere. In addition to effect that CFCs have on stratospl ozone, it has been discovered, o recently, that these gases are a m contributor to the "greenhouse effe Scientists now predict a major gl climatic warming as a direct co quence of the production of CFCs combustion of fossil fuels and c human activities.

Previously it was thought that can dioxide was the major gas involve the greenhouse effect. However, C are now known to be up to 10,000 ti more efficient at absorbing infra radiation. Within 30 years, it is an pated that the effect of CFCs coutweigh carbon dioxide and o greenhouse gases.

The second theory suggests the shift in atmospheric dynamics contretes to the ozone hole. For example, 1987 Airborne Antarctic Ozone Expinent found that on one day, Sepozone levels fell by about 10% over area of some 3 million sq. km. in Anctica. It was concluded that chemic is not a likely explanation for sucdramatic fall, but that air movement

On-site storage of N-wastes stressed

clear waste should be stored on or 100 years until the problems of term disposal can be solved, a report says.

ducing the risks: "Policies for the gement fo highly radioactive ar waste" is a study by Mr. Arjun hijani of the Institute for Energy Environmental Research in Wash-

many years of secrecy in the artment of Energy have resulted in onishing scientific and technical expetence' in search for a site for pository.

ne present process should be aband and a new programme for ontorage adopted, the report argues.

t's an Alice-in-wonderland type ion," Mr. Makhijani said. "The ar regulatory commission (NRC) is it reasonable that a repository site being evaluated, selected and med to protect public health and the comment according to standards a have been invalidated by the s", he added.

1987, the Environmental Protec-Agency's (EPA) standards were dated by the courts. The Departof Energy has long ignored, disor suppressed unfavourable data eports so that it could proceed dered in its site selection", the says.

s has resulted in repeated failures ect proper sites. The report argues colonged on-site storage of nuclear would reduce transportation rs. The waste should be stored in lifest interim forms.

to serious delays in finding a tory, most nuclear electric facilvill be forced to build more onpage anyway, the report says. "There are no good solutions to this problem, let's face it. It is a very messy situation", Mr. Makhijani said. "We created a monster without thinking very much about the consequences. We have to make the best of the worst", Mr. Makhijani added.

Extended on-site storage will allow time for the development and testing of safer transportation containers, make the dismantling of nuclear power plants more economical.

ACTION AGAINST POLLUTING UNITS IN GUJARAT

The Gujarat Pollution Control Board has identified about 1000 industries violating the provisions of the Water and the Air Pollution Act and filed cases against them.

The board has obtained stay orders against 150 units. It also recommended some of the highly polluting industries to the Union Government for action under the Environment (Protection) Act, 1986. The board has issued orders for the closure of two industries under the Air Act. As a result of strict action taken by the board, more than 1,200 industries have installed effluent treatment plants.

Addressing a news conference in Ahmedabad recently Mr. K. Mahipatsinhji, Chairman of the board, said that it has recommended the setting up a separate court for early disposal of the cases.

A working group set up by the State Government under the chairmanship of the Industries Commissioner had submitted its report to the authorities in which the setting up of a common effluent treatment plant in all 10 chemical industrial estates of GIDC has been recommended, he informed.

The board is monitoring all major rivers of Gujarat every month, Similarly

to check the quality of air, it has established ambient air quality monitoring stations at Surat, Baroda and Ahmedabad.

The board has obtained financial assistance from the Union Government and accordingly 20 monitoring stations have been established to monitor the coastal waters, he said.

The board is also in the process of setting up of a central laboratory at Gandhinagar. This laboratory will be equipped with sophisticated equipments to carry out R and D, he observed.

ACID RAIN THREAT LOOMING

The spectre of acid rain is looming large over the country and unless immediate steps are taken on a war footing, the problem would deteriorate further, according to Dr. L.T. Khemani and Dr. G.A. Varma of the Indian Institute of Tropical Meteorology, Pune.

In a paper presented at Bombay on June 3, at a day-long seminar on "global effects of air pollution -- an update and strategies", organised by the Indian Merchants Chamber (IMC) on the eve of the World Environment Day, Dr. Varma and Dr. Khemani said acid rain had already been reported at Chembur area near Bombay a few years ago. India's sulphur dioxide emissions have tripled and the pH factor has shown considerable changes and rain has become more acidic.

According to a report, India is among the five countries that may witness the ravages of acid rain. Kerala and Karnataka are likely to bear the brunt of acid rain, the consequent fallout of air pollution caused by increasing number of vehicles and industries. These two States would be worst affected by air pollution in view of their soil's sensitiveness to acid rains, the report says. Acid rains are likely to cause ravages in the tropical forests in China, Brazil, Nigeria and Venezuela, besides India.

Ecological disaster round the corner

The world is racing towards a worst ecological disaster. The combined efforts of rapid deforestation, population growth and urbanisation is taking a heavy toll of the environmental wealth, ecologists say. June 5 the World Environment Day to serves as a reminder of the menacing degradation.

Already, more than 625 million people mostly in the Third World are breathing air contaminated with carbon and nitrogen dioxide gases, says a report of the United Nations Environment Programme (UNEP).

UNEP report, based on a survey conducted in 60 countries over a period of 10 to 15 years, says eight cities have been marked with the highest levels of sulphur dioxide. Five of the eight cities are in the developing world: Shenyang, Teheran, Seoul, Rio De Janerio and Beijing. The rest are Milan, Paris and Madrid. Tokyo, Hong Kong, Shanghai, New York, London and Athens have been bracketed in the mid-range category.

The report states that ten per cent of the world rivers are polluted, with the Ganga heading the list. Rapid industrialisation and population growth is expected to pollute more rivers in countries such as Brazil, Mexico, China, Indonesia and Nigeria.

Tropical forests are shrinking at a rate of 27 million acres a year and about half of the world's irrigated land is in danger, says the world population report, published by another United Nations agency.

The report says all this is happening because of rapid deforestation in the Third World which itself is an attempt to find new land and increase food production to meet the needs of their population growth.

The tropical rain forests -- home to than half the world's plant

animal species -- are disappearing at the rate of 20 hectares a minute, according to the World Wide Fund (formerly known as World Wildlife Fund).

The Washington-based World Watch Institute also depicts a grim scenario about the earth's physical conditions in its report entitled 'State of the World 1988'. The World Watch report says "the earth's forests are shrinking, its deserts are expanding and its soils are eroding".

Each year thousands of plant, animal species disappear, many before they are named or catalogued. Raising concern about the thinning of the ozone layer in the upper atmospheric surface and the rising temperature of the earth, it warns Governments that such developments are posing a threat of unpredictable magnitude to all the systems that support life on earth.

UNEP study on global warming forecasts an increase in global temperature by 4.5 degree Celsius by 2000. This warming could raise sea level everywhere by more than two metres threatening one-third of the world's population living within 60 km of coastlines. This could even wipe out the whole of the Maldives Archipelago.

A rise of less than one metre in sea levels could destroy 27 per cent of Bangladesh. Egypt could lose 20 per cent of its productive land and the US, between 50 and 80 per cent of its coastal wetlands. Apart from raising sea levels, global warming could cause serious damage to agriculture.

Wheat production would have to move north where depleted soils could result in falling crop outputs. The production of rice would also fall due to high temperatures. The world in general would witness dust storms, dying forests, unbearably hot cities, forest fires and outbreaks of diseases. If the phenomenon of warming continues into the

next century, the Arctic and Anglaciers could melt and sea level 100 metres as a result.

This would flood all ports and major cities of the world, accord a report of the centre for science nology and environmental policidies.

POLLUTION CONTROL: TO IMPOSE NEW NORMS FOR INDUSTRY

The Tamil Nadu Government decided to impose a pollution conditionality, for the clearance environment-sensitive industrial

Disclosing this at a function g to observe the World Environment the State Chief Minister, Mr. Ka nidhi, said that the State-level clea of applications for new industrial will be guided by their prepared install pollution control equipme part of the plant configuration.

The Chief Minister, who also Industry portfolio, said such a c tionality will apply especially to likely to pollute the environment

He indicated that this new redesigned for environment-sensurits, is in addition to the exircquirement of environmental clear at the State-level by the Tamil I Pollution Control Board (TNPCE)

The Chief Minister was inaugurathe Tamil Nadu Society of Social I stry Research and Development, as of the observance of the World Eronment Day by Tamil Nadu Pollu Control Board.

He further said that in his recent cussions with Union Government cials he had explored the scope World Bank-aided environment enation project in the Palani-Nilgir in Tamil Nadu.

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OTLIGHT ON

Biotechnology & Life Sciences (Part 1)

NEW HEAT-STABLE PRO-ASE ENZYME ISOLATED

new enzyme with superior permance abilities in detergent applicates was recently discovered in a trobe thriving in a swamp in Mexics Yucatan province. The discovery described as accidental by Todd sek, the Cornell University research who isolated the microbial origin tyme. However, systematic study of enzyme followed.

The new enzyme was found to be raly active, and highly stable. It can trate alkalinity, highly concentrated mulation hard water and high heat. latter property is particularly signant for the European and Japanese lkets, where wash water temperates are in excess of 60°C.

resently, subtilisin is the most ally used enzyme in the detergent estry. The researchers tested the pernance of the enzyme (called YX-ease) against subtilism in 80°C, the and found the new enzyme to be een times more efficient in break-down cellulose and protein stains. 60°C, it proved just as active, onstrating its stability at a broader e of higher temperatures.

ne problem to be worked through, say researchers, is how to mass uce the enzyme for commercial use. researchers hope to accomplish ugh genetic engineering. The me does not pose any health hazard esearchers expect FDA approval not be difficult to come once they found a vehicle in which to suc-rully clone the material.

addition to the detergent field the renzyme has potential applications

in the production of protein-rich therapeutic diets for people who cannot eat solid food. The dairy industry may also find use for it in cleaning filtering devices used in manufacturing concentrated milk. Membranes get clogged as protein deposits accumulate and tests have shown that YX-protease clean these membranes in one hour compared to the 24 hours required by enzyme-based cleaners currently marketed for this purpose.

Cornell University has a patent pending on the enzyme. This enzyme has evoked a lot of interest in the worldwide market. For industrial applications of the enzyme much research is expected from the relevent industries in the future. The YX enzyme was isolated in "steamy compost piles" growing in temperatures where other bacteria could not possibly survive. The group of scientists initially set out to isolate enzymes to break down compost type materials in by-products of the paper industry to act as "the in-between agent" in the conversion of the by-products to ethanol. (CMR, 1/20/89, p. 19)

MERCK SHARPE & DOHME RESEARCHERS UNVEIL AIDS ENZYME BREAKTHROUGH

Researchers at Merck Sharpe & Dohme have unveiled the crystal structure of a key AIDS virus enzyme which could lead to the design of more effective drugs. Manuel Navia and his colleagues have revealed that AIDS protease --- a protein degrading enzyme --- is structurally very similar to other protease such as the human digestion enzyme, pepsin.

Prof. Tom Blundell of Brikbeck College, University of London, believes these revelations point to the possibility of designing AIDS protese inhibitors similar to those already being used

medically to inhibit other aspartic protease such as renin. Retroviruses, such as AIDS virus, carry the genetic blueprint for three enzymes: reverse transcriptase, integrase and the protease. Each of these enzymes is essential to the survival of the AIDS virus and represents a potent target for the drug design.

To-date the only drug registered to curb the AIDS virus is Wellcome's Retrovir. This drug works by interfering with reverse transcriptase, but unfortunately is not specific enough to avoid side-effects. Retrovir can cause anaemia in some patients. A specific inhibitor of the AIDS protease should reduce the risk of toxicity. (ECN, 2/20/89, p. 16)

BIOSPHERE II --- A MAN-MADE ECOSYSTEM BASED ON SOLAR ENERGY

More than 100 km. of steel pipe form the skeleton for Biosphere II, a unique self-contained environment now being built in the desert of Arizona. Sometime in 1990, eight humans, some 4000 plant and animal species, and around 10 million litres of water will be sealed in the giant greenhouse, which covers a hectare of desert. They will remain there for two years. It is designed to be the first completely closed biological system designed and built by humans. Biosphere I is the Earth, but we did not build that ourselves.

Bioshphere-II will contain several separate ecosystems, including a small ocean, marshes, lagoons, a sandy beach, a tropical forest and grassland. Only the sun's energy will be allowed in. Plants will provide oxygen for animal life, which will in turn provide carbon dioxide for plants. The people will harvest the produce for food and hope that microorganisms in the avil will keep the air clean. Nobody knows whether the

biosphereans will survive the two years. Anything from smog to civil war could finish them out. (New Sc, 2/4/89, p. 24)

ICI ACQUIRES CAMBRIDGE RESEARCH BIOCHEMICALS

ICI has boosted its biotech interests with the acquisition of Cambridge Research Biochemicals (CRB). The Company sees good potential in the biochemical market, valued at several hundred million dollars/year and says it wants to become a world leader in the development and marketing of biochemical products.

CRB purchased at the cost of \$3.8 million, supplies peptides, antibodies and other biochemicals. Although the 60 strong workforce will remain located at Cambridge the company will be merged with ICI's biological products business based at Billinghem on the Teesside. CRB fits into its biological products niche businesses, which is based on fermentation. CRB's operations will be expanded.

Synthetic peptides are used in the R & D of new drugs, vaccines and diagnostic reagents. CRB has developed an improved chemical method for synthesizing peptides. In the past few years, the biotechnology-based concern has used synthetic peptides to make antibodies used as research and diagnostic reagents, particularly in the field of cancer. Incidentally, ICI's pharma division has a small in-house capability for making peptides. (ECN, 2/6/89, p. 12)

TWO NEW ENZYMES DEGRAD-ING NUCLEIC ACIDS ISOLATED FROM SNAKE VENOM

Researchers have recently realized that snake venom can serve as a source of several interesting enzymes. Enzymes are proteins, that are present in all living organisms and serve as biological catalysts that are responsible for converting one substance into another in living systems. Recently, two new

enzymes have been isolated from the venom of cobra snakes at the Centre for Cellular & Molecular Biology (CCMB), Hyderabad.

These two enzymes degrade nucleic acids, which are important in genetics and heredity. The enzymes carry out this degradation at specific chemical bonds and can therefore be used to determine where such bonds are present in the nucleic acid molecule. No enzymes, that would degrade the specific chemical bonds at which these two new enzymes act, are so far known. Therefore, these enzymes will find wide use as reagents for research in molecular biology and genetic engineering. This may lead to development of new techniques for determining the structure of RNA (ribonucleic acid), one of the two types of nucleic acids present in all living organisms.

A NOVEL BIOTECH PRODUC-TION ROUTE FOR DRUGS & CHEMICALS FROM PLANTS

Plant Genetic Systems (Ghent, Belgium) a major European biotech firm reports its researchers can now engineer plants to produce high value pharmaceutical peptides, including blood factors and growth hormones.

It is foreseen that economic benefits from man-made products obtained through "molecular farming" will be substantial for the chemical and pharmaceutical industries in particular. PGS researchers are so confident that the Company has already signed a supply agreement with a major pharmaceutical company in Europe. (Chem Wk, 3/1/89, p. 7)

FDA (USA) BROADENS ITS ROLE IN BIOGENETIC RESEARCH

The FDA in USA could ease into biotech research in an unusual way a "national biotechnology cooperative" that would be part of a renovation of facilities at the Agency's National

Centre for Toxicological Resear Arkansas. So announced FDA of missioner Frank Young at a bid conference in California recently said the new facility would be available to small biotechnology and academic research groups, have at present no access to "state the-art" research facilities of their Also ahead the Commissioner's placeton such laboratory located at cago; a sort of joint research effort the Illinois Institute of Technology the University of Illinois. (All 12/1988, p. 49)

EFFLUENT ENERGY ON THE COMMERCIAL HORIZON

A process which makes effluents a high organic content --- such as the from food or beverage processing planet acceptable for disposal with penalty by water authorities, while grating a valuable fuel by-product been developed by Biomechanics (UK). It minimizes the yield of slut and eliminates the need for drying but it is odour-free and complies with pollution regulations.

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ENGINEERED ORGANISMS II THE ENVIRONMENT

A lay summary of the first intertional conference on the release of getically engineered microorganis (REGEM) is briefly covered in a plication "Engineered Organisms in Environment".

This booklet is available from Pr Alan Paton, School of Agriculture, U sity of Aberdeen, 5 B1 King St; deen A 89 14D, U. K.

OVERVIEW ON RESOURCE COVERY OF MUNICIPAL ID WASTES

esource recovery of municipal solid the provides an overview of current mology options in the field and a sussion of the environmental, ecotic and political issues, focussing attion on the relevance of chemical meering and chemical engineers in solution of these problems. This dication is available, priced \$45 to members from American Institute Chemical Engineers, Publications 5, 315 East, 47th Street, New York, 10017, USA.

IMPLE BIOTECH PROCESS R VIT C ON THE HORIZON

leading biotech firm Genentech in is doing active research to develop apple biotech process to produce vital C (ascorbic acid) commercially considerable economy in the cost coduction.

present most Vit.C is produced by diffication of the Reichstein Gruss-Synthesis that involves a single bial fermentation step and a series remical steps. The last intermediate the Reichstein-Grussner synthe-2-Keto-L-gluconic acid (2-KLG), repound that can be easily converted L-ascorbic acid via a simple acid se-catalysed cyclization. An altermicrobial route under study by ntech researchers is shown in Fig.

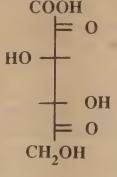
is a tandem fermentation route pting to convert glucose to to-L-gluconic acid (2-KLG) to ve maximum economy in the cost oduction of Vit. C.

ganisms from the cornyform group steria (Cornybacterium, Brevibacand Arthobacter) as well as speof Micrococeus, Sataphylococcus, Pseudomonas baccilus and Citrobacter are able to convert 2,5-diketo-Dgluconic acid (2,5-DKG) into 2-KLG. Furthermore, species of Acetobacter, gluconobacter and Erwinia can efficiently oxidise D-glucose to 2,5-DKG. Thus, 2-KLG can be produced from Dglucose via 2,5-DKG by a cofermentation of appropriate microorganisms from the above two groups or a tandem fermentation process. Although, the tandem represents a considerable simplification in the route from D-glucose to L-ascorbic the Genentech researches goal is to simplify this process further by combining the relevant traits of both the Erwinia Sp and the Cornybacterium Sp in a single microrganism. To accomplish this goal in future, they identified the 2,5-DKG reductase in the cornybacterium Sp that was responsible for converting 2,5-DKG into 2-KLG. The gene for the reductase was then cloned and expressed in Erwinia herbicola, which can convert D-glucose into 2,5-DKG. The resultant organism is able to convert D-glucose into 2-KLG in a single fermentation. (Refer fig 1.)

In this example seperate biochemical pathways from the two organisms were joined by cloning and expressing a gene from one into the other. However, even this simple case of metabolic pathway engineering is extremely complex and will require a few years research in genetic engineering and enzyme manipulation.

Genetech has, therefore, formed a joint venture to pursue this breakthrough with Lubrizol Corporation. The joint venture is known as GLC Associates and is reported to be working with Pfizer to continue process development for this novel biotech process of vit. C. (1. 'Ascorbic Acid Process Economics Report, (No. 144 SRI Intl., Menlo Park 1980)

2. Science, 1985, 230, 144)



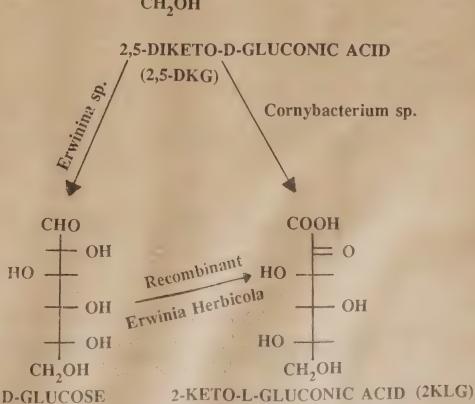


Fig. 1: Tandem Fermentation Route and Direct Route from Glucose to 2-KLG

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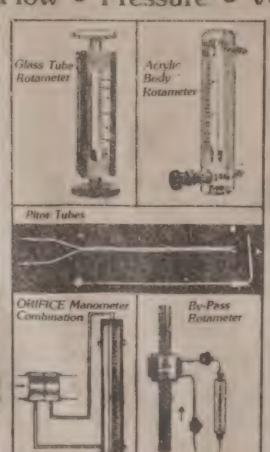
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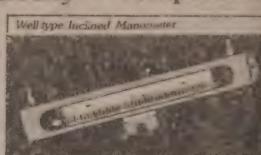
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Food and Pharmaceutical Technology in Perspective

CANAT --- A NEW NATURAL GAR FROM SWISS RESEARCH

Sucanat is a sweet alternative to ined white sugar recently marketed Pronatec Ltd. (Switzerland). It was reloped by Dr. Max Henri Beguin. It a natural product, since it is fully hydrated, evaporated cane juice. Such contains all the vitamins and trace herals lost during refining of sugar

Sucanat is made by pressing the cane, ering the juice to remove cellulose res, concentrating the juice, then and in a vacuum and granulating. The rult is a final product, which is a 1:1 dacer for sugar with 2.5% mineral as, vitamins and minerals such as assium, calcium, iron, phosphate, gnesium, zinc, copper and chrom-

This natural sweetener is not a lowinitial products. It has slightly fewer
initial right in the equivalent of white right ined sugar. Over 60 food companies shown active interest in this natsugar. (Food Engineering Intl., Oct.
3, p. 53)

'ERAL SPECIALITY SUGAR NTURES ON THE HORIZON IN ROPE AND USA

Teiji Seika, a leading Japanese cononer is teaming up with sugar proir Beginsay to produce and market wartificial sweetener in France. Iniir a \$77000 (10 million Yen) joint are firm BMI will be set up in Paris roduce fructo-oligosaccharide for al feed. In the future, the product be made for human consumption.

MI anticipates sales will eventually 1 Yen 2 billion/year in European Scandinavian markets. The Japafirm had set up a similar joint venture in the USA last year with Coors biotech in Westminster, Colorado.

In addition, ICI's Biological Products Division has recently signed a collaboration agreement with Pfanstichi Laboratory of Chicage, Illinois, a manufacturer and supplier of speciality sugars and biochemicals for use in pharmaceutical, agrochemical and diagnostic sectors. The move is designed to boost ICI's world ranking in biochemcals. (ECN, 3/27/89, p. 20)

SAFFRON STIGMAS PRODUCED IN VITRO IN THE LABORATORY

Researchers at Ajinomoto Co (Tokyo, Japan) have succeeded in producing Saffron stigmas in vitro, opening up the way for the mass production of the world's more expensive spice. The technique was drawn from biotechnology related studies performed by plant scientists at Ajinomoto.

Saffron's high price derives from the short supply of stigmas and the enormous number needed to make spice. More than 500,000 are necessary to obtain 1 kg. of saffron. Produced in Spain, (Kashmir) India, Afganistan and a few other countries, the saffron blooms for two weeks annually during which it must be picked by hand and dried. (Food Eng Intl., 5/1988, p. 21)

INCREASE IN SEAFOOD CONSUMPTION IN HEALTH CONSCIOUS DEVELOPED COUNTRIES

Seafood consumption around the world is increasing. A large part of this growth can be attributed to the international concern for healthier foods. Per capita consumption of seafood is increasing in almost every developed country of Europe and North America. Two new developments, aqua-farming

and surimi processing are expected to continue in Western Europe and North America.

The per-capita seafood consumption in 1986-87 in some leading developed countries are stated in Table 1:

Table 1:

Per-capita Seafood consumption 1986-87 in kg. in leading health conscious counties

USA		6.7
FRG		13.2
Japan		70.0
UK 1	en e	20.0
France		20.0
Spain		36.0
Portugal		36.0
Sweden	14.7.	36.0
Denmark		36.0
Norway.		48.0

In USA, the per-capita consumption of seafood totaled 6.7 kg. in 1987, the highest total ever. The principal imported seafood product in USA was 180 million kg. of shrimp in 1987 at a record \$1.4 billion.

HONEY INHIBITS BROWNING IN FOOD PRODUCTS (FRUITS, FRUIT JUICES & WINES)

Researchers at Cornell University have found recently that treatment with honey can keep white wines and fruit juices from turning brown as they age. The researchers hope to patent the colour stabilization process in wine and grape juice. Robert W. Kime has already received a patent (US Pat 4,327,115) on honey clarification of fruit juices and assigned it to the Cornell Research Foundation.

Besides changing the colour of fresh fruits and juices, the browning reaction adversely affects flavour and nutrients, including vitamin C. Food processors

typically use sulphite additives to inhibit the reaction. The sulphite can cause allergic rections in some people, however, which is one reason why the FDA in USA limits their use in salad bars. A practical alternative to sulphites could be greatly appreciated.

Browning is caused by oxidation of phenolic compounds. It could easily be prevented, researchers argue, if only one or two compounds were involved. Each kind of fruit has several, however, and hundreds exist altogether.

In the process developed by Cornell researchers C.Y. Lee and Robert W Kline, 1 to 10% by weight of honey is added to juice, which is then agitated and left at room temperature for several hours. A brown sludge forms, and is filtered out and the juice then remains clear indefinitely.

Lee and his colleagues are analyzing proteins in honey to see what does the trick. So far they have learned that the most important protein originates in the bee, not the flowers, and that almost any species of honey bees can produce the protein. (C & EN, 12/19/88, p. 78)

DIET AND DIAGNOSTIC TESTS

Diagnostic tests have become a significant tool in modern medical practice. Foods affect diagnostic tests in many ways giving false positive results. Therefore, diatetic habits, too, affect the outcome of many diagnostic procedures.

The standard test for blood in faecal sample, one sign of cancer in the intestinal tract, may be rendered inaccurate by vitamin C (ascorbic acid), which, in passing through the large intestine, bonds with haemoglobin molecule in the stool, preventing peroxide the essential reagent used in the test, from reacting with.

Similarly, hot dogs (frankfurters) may be laced with iodides which affect the reliability of thyroid tests. Also, several cups of coffee swallowed before a visit to a doctor may act as a diuretic increasing the outflow from the kidneys and diminishing the filtering of ureic acid, thus indicating gout.

When diagnostic tests are done prematurely, they amount to nothing more than an expensive expedition.

If a physician is unaware that a patient has been eating a lot of leafy green vegetables -packed with vit. K, a natural coagulant - he may misinterpret a blood clotting test and prescribe medication that causes the patient to harmorrhage. (*The Sciences*, Jan/Feb 1989, pp 23-24)

A JOINT RESEARCH PROJECT TO DEVELOP A NEW EDIBLE OIL FROM FLAX SEED

Biotechnica (Canada) and Australian CSIRO are collaborating to develop a new edible vegetable oil from flax seed. Under a proposed joint venture the researchers from the above two countries will develop varieties of flax which produce oil similar to sunflower or corn oil.

By the mid 1990s edible oil flax may be grown on several million acres as an alternative crop.

DIRECTLY COMPRESSIBLE NIACINAMIDE DEVELOPED BY LONZA, SWITZERLAND

Lonza, Switzerland, has recently developed a directly compressible niacinamide. The company reports that independent laboratory testing confirms the superior flowability and tabletting capabilities of Niacinamide (USP). This vitamin contains no additives and achieves a purity level of even 99% so complying with USP. Ph. Eur. and other pharmacopia. It is available in foil-lined bag-in-box packages. Each box containing 20 kg. For further details contact: Lonza Nutrition Products, P.O. Box CH - 4002 Basle, Switzerland.

A NEW RANGE OF NATUR BUTTER FLAVOURS DEVE OPED FOR MICROWAVE F CORN

Microloc, a natural butter flav a new series of natural butter flav designed for ultimate flavour per ance in microwave popcorn, has recently by Felton in Canada.

The development of these nervours are based on Felton's revolutionary new microwave research. The T theory, specifies the precise can solvents and flavouring agents will provide maximum flavour strestability and integrity in microapplications.

Microloc butter flavours provid creamy, fall flavoured taste and a to microwave popcorn; flavour aroma which remain after pop when and where you need it mo

These new flavours are availabliquid oil-soluble concentrates as paste forms. They are recommended use in all natural flavoured micropopcoms. (Food in Canada, June 19, 441)

HIGH-YIELDING CARDAMO THROUGH TISSUE CULTUR

Large scale production and continuous propagation of high yielding cardar saplings by tissue culture technologies been perfected by researchers a Hindustan Lever Research Ce Bombay.

Researchers have succeeded regenerating 10,000 plantlets of commom from a single short-tip and it past one year have supplied 20,000 saplings to different plantations it country. For the year 1989, two plantlets are on their way. The plantare supplied when they are three mold, having a height of about nit twelve inches.

necessary requirement for realizing otential of micropropagation technis is successful transfer of tissue cultaised shootlets to the soil. The orchers have achieved a 100% ess rate in the transfer of regeneral plantlets to soil after in-vivo as well witro rooting for large scale multition.

re scientists obtained the shoot tips ardamom from rhizomes of highling disease-free varieties. These given about 1 to 2 kg. of cardaby dry weight per plant. Hence, is a potential yield of 2,400 kg. per are considering that about 1,200 kg can be grown in one hectare.

ardamom is conventionally propadeither by seeds or rhizomes. While eed-raised plants show high varimultiplication by rhizome is slow prone to diseases. Moreover, it is possible to plant large areas with table rhizome stocks. Under these mstances tissue culture provides a rand better method of multiplicareports Dr. Bhaskaran, head of the Culture Dept. of Hindustan Research Centre. (PTI Science (22, 7(21), 1988, 6)

NTERNATIONAL AWARD APPLE JUICE CONCEN-TE BAGGED BY HPMPC

Processing Corp. (HPMPC) has awarded the prestigious "International American Award 1988" for their uality apple juice concentrate.

Corporation has exported 15 of apple juice concentrate to the last year. (Economic Times, 188, p. 8)

W CANCER DIAGNOSTIC FOR EARLY DETECTION ANCER DEVELOPED BY ELI SCIENTISTS

entists at the Weizmann Institute

(Israel) have learned how to employ a naturally occuring body enzyme - creative kinase - to observe changing cell activity within hours. Using the enzyme-creative kinase (CK), the scientists can see immediately how living organisms react to a specific biological substance before other changes occuring and confuse their observations. The use of CK as a marker has been considered as a possible early test for cancer.

The usefulness of CK as a signpost of biological reactions was seen in laboratory experiments in which hormones were applied to tissues by a group of scientists led by Prof. Alvin M Kaye, who holds the chair of molecular endocrinology at the Weizmann Institute. The team applied the hormone oestrogen to surgically removed breast tumours and studied the activity of the CK enzyme. They found that malignant tumours reacted differently to oestrogen stimulation then benign tumours.

Other tests using CK as a measurement revealed that Vit. D could be important not only in the growth of bones, but also in the brain and kidneys. (News from Israel, 4/1989, p. 12)

WORLD'S BIGGEST VACCINE PROJECT COMING UP IN INDIA WITH FRENCH COLLABORA-TION

Institut Merieux has signed an agreement with the Indian Government to set up a joint venture vaccine plant at Gurgaon, near New Delhi as part of the Indo French medical research agreement. The new plant is the most important single investment to be made anywhere in the world in the field of vaccine production during the last 30 years.

The 20,000 m facility will occupy a 10-hectare site and employ over 270 staff. Merieux will provide the technology for the mass production of vaccines for polio, measles and rabies.

There are several hundred thousand cases of polio in India every year, as well as over 30,000 cases of rabies. The Indian government desires to achieve an 85% vaccination rate by 1995. By 1992, the new plant will be capable of producing 50 million doses of polio vaccine, 20 million of measles vaccine and 2 million of rabies vaccine.

In order to ensure the smooth transfer of technology, 15 Indian biologists and engineers are to be trained in Lyon (France) by Institut Merieux and 18 French specialists will work at the plant when it is completed. In the long term, cooperation with other Indian research institutes, particularly, the National Institute of Immunology of India, could lead to a significant research programme in the area of biotechnology, especially in recombinant vaccines.

AN IMPROVED APRICOT JUICE BASED ON THE ENZYME CEL-LULASE

A new process developed by USDA researchers for apricot juice, will provide clear apricot juice. At present only a thick, translucent juice can be made from pulp, because it is difficult to separate the cellulose fibres in the juice.

The USDA researchers have successfully produced a clear apricot juice on a 15 gallon lab scale by using a blend of cellulase enzymes to break down the cellulose fibres. The juice is subsequently clarified through ceramic filters.

The process can be commercialised since now low cost cellulase has become available from Genencor Inc (a US based biotech firm). (Chem Wk, 34 (1), 1988, 81)

DRY CASHEW FRUIT ON THE HORIZON

A pilot plant for the production of upgraded dry fruit from cashew has been set up at Palghat by Prof. P.M. Edessery of the Pelatine Flower Food

Research Station, Palghat. In the process the ripened cashew apples are sliced and cured for one hour in hot antastrin solution. Thereafter, it is driedin the sun and later soaked in sugar solution. The dried fruit can be a superior substitute to other dried fruits. (TO1,26/11/88, p. 10)

NEW MEDIUM FOR DETECTION OF E. COLI

Lauryl tryptose broth with MUG is a new product medium for the detection of E. coli, often in less than 24 hours. It is available from Gibco (UK).

Most strains of E. coli contain an enzyme B-glucuropidase. When MUG (4-methylambedliferi B-D glucuronide) is cleaved by the enzyme, fluorescence at 366 nm characterised by a strong blue green colour is apparent. After aerobic incubation at 35 + 2°C for 18-24 hours, E. coli can be easily identified by gas production and fluorescence under UV light. (Lab Practice, 2/1989 p. 28)

TOPICAL MEDICATION FOR MALE PATTERN BALDNESS DEVELOPED BY UPJOHN (USA)

The FDA in USA has approved Upjohn's Rogaine, 2% solution of topical minoxidil for the treatment of male pattern baldness. The product is marketed in 45 countries at present.

According to the FDA, clinical studies indicate that after one year of therapy 39% of the patients had demonstrated moderate to dense hair growth on the crown of the head and 61% had shown little growth or none at all. FDA recommends that before treatment, patients should have a physical examination and they should be monitored one month after starting treatment and atleast every six months thereafter.

NEW FOOD PRODUCTS FROM LIPTON SOON

Lipton India Ltd. will introduce a

number of new food products and beverages in the Indian market over the next two years.

Mr. B.R. Shah, chairman, Lipton India, said in Calcutta recently, that sizeable investments had already been made on research and development in relation to the products.

Lipton, an affiliate of the Hindustan Lever group, he said, was putting an accent on the foods and beverages market in view of its high growth potentials. He, however, declined to elaborate on the products and the size of investments made in them.

Earlier, at the annual general meeting, Mr. Shah said the company's two major businesses, edible fats and packet tea opened the year with sqeeze on margins attributed to many reasons. Of particular concern was the significant rise in tea prices, which could not be fully neutralised in settling prices.

According to Mr. Shah, Lipton's current strategy was to increse its stakes in the liquid oils market. The popular brand, Dalda refined oil, continued to gain market share. A new brand of liquid oil, Flora, introduced quite recently, had made encouraging progress.

As for the dairy business, the company, he said, was examining some new product possibilities in this area, which should further add to the strength of this business.

In the domestic tea business, the package segment, he said, was now seeing significant growth with the introduction of tea in polypacks. "Taaza" tea, launched in polypacks, in the second-half of 1988, had fared well in the market. Reports suggested that the gains were coming primarily from an upgradation of loose teas which could only benefit the company in the coming years.

Mr. Shah said the company had

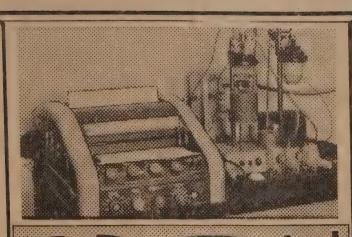
launched a new range of product its new foods business group. A begining had been made with a of fruit drinks under the brand "Tree Top". After a sucessfi market in Calcutta, Tree Top ha been launched nationally. Sir growth prospects were good, the pany would continue investment this brand and have it as one major brands in the rapidly gr fruit drinks market in the co Encouraged by the success of Tre the company was also examining opportunities in the cold bev market, which offered excellent opportunities for the future.

Lipton, also launched a range of ular biscuits as part of its strate diversify into growth segments foods and beverages market. The pany's brands were manufacture selected locations by using the capavailable in the small scale sections.

In the 18 months of the 1988; Lipton recorded sales to the tuRs. 588 crores, as against Recorded profit before and after tax at Rs. 21 crores and Rs. 12 crored dividend for 1988 was 22 percent

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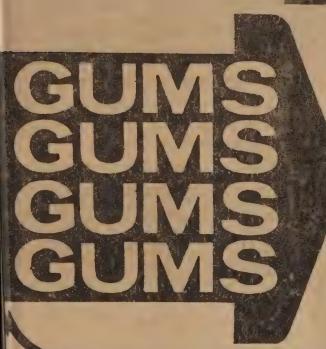
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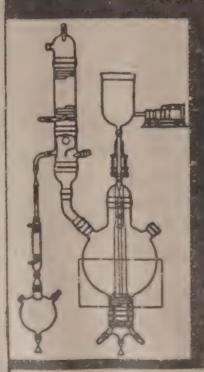
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Small Scale Chemical Industry — Suggestions *

S. LAKSHMIR AGHAVAN
Vice-President, Chemical Industries Association

Cerala offers great scope for setting up chemical indussin the small scale. With natural resources like vegeta oils, minerals chemicals manufactured in the large scale ustry as raw materials and by the presence of a very active repreneural class, there is ample scope for setting up of rege number of small scale industries in Kerala meant not by for supplies to large and medium organisations like SC but also for the rest of the country and if well planned, on for exports. In this connection, the following are few that need to be considered seriously.

Chemical industry based on the vegetable oil has good ential. These are Soaps, Fatty Oil, refined and hydrogenied edible oil, rice bran oil etc. Other areas of interest can sibly be essential oils, based on various aromatic plants are abundantly available in Kerala. Essences and extracts essential oils are in very great export demand with the facilto set up in the small scale sector.

here are a host of pharmaceutical products that can easily manufactured by the small scale industries and Kerala is lly suitable for this. Many of the bulk products like Aspi-Paracetamol, Ibuprofen can easily be produced in Kerala. It that HOC is ready to supply Phenol, Acetone, etc. the billities of expanding Phenolic resins and other allied bucts are abundant.

in the inorganic chemicals sector, Kerala has vast potenties for establishing manufacture of Sodium Silicate with a of various grades. In view of the fact that the nearby so do not have the quality of raw-material (limestone) ded for manufacture of pure precipitated Calcium Carate of high grades, the sea shells available in large quanton the Kerala seashores do form a correct raw-material entrepreneurs to venture in this area.

male scale entrepreneurs, mostly technocrats, we find, in the art of discussions with the financial institutions are viability of the project and more especially in the cost financial aspects. They have to employ competent financial executives and base themselves for proper finance otherse they are invariably at the mercy of the financial tutions and commercial banks, who, inspite of their wilness to help are always at a disadvantage to extend assurto small and smaller people who need long term

loan and working capital. Inspite of these inherent weaknsses, entrepreneurs will definitely succeed if the following norms, prescribed in the appraisal of small scale industries project are strictly followed.

- 1. A quick and fair appraisal of the financial requirements and timely sanction/release of funds without rigidly insisting on completion of formalities.
- 2. Acceptance, by commercial banks, of the estimates made by financial institutions of the working capital needs of units.
- 3. Close co-ordination between financial institutions and banks on the conduct of the account through the media of (a) exchange of views and (b) periodic meetings at which entrepreneur is also present.

Once an industry is identified and well thought out, it should be set up on a methodology by choosing the right knowhow, equipments and expertise. The possibility of pollution which requires ordering for planned processing equipments and suitable effluent treatment should be carefully thought of from the planning stage itself and layout, etc, should be made properly from the beginning with an eye on safety aspects. Planned on the above basis, the success of the venture would be assured.

Although, many schemes fail for want of financial aid from institutions and bankers at the right time, most ventures fail to take of only because the entrepeneur does not devote sufficient attention to these aspects, besides marketing.

The Chemical Industries Association has carried out lot of work in this regard and will only be too happy to advise on what would be referred to them from Kerala and share their expertise in this regard.

Kerala has a very bright future for chemical industry, since apart from supplying the market and developed technology in many sectors, VSSC at Trivandrum stands to confer help to the state besides other organisations like HOC at Cochin for supply of essential food stocks. It may be that the investment limit for SSI's as represented by our and many other associations may be raised upto Rs. I crore at the present level of cost and value of money, to facilitate the growth of many small scale units especially on the chemical side, which is bound to increase Kerala's prosperity and employment potential, which increase, it badly needs.

Growth of Chemical Industries in Kerala, organised by Chemical Industries Association, KSIDC and Institute of Chemical Engineers, Trivanton on 18-2-1989.

Prospects and Travails of Establishment of Chemical Industry in Kerala*

C.C. MENON

Manager (Technical), Western India Plywoods Ltd., Baliapatam

The elimination of poverty and the improvement of the quality of life depends to a great extent on the ability of the manufacturing industries to generate wealth. The industrial creation of wealth consists of the basic operation of addition of useful work to materials so that they could be sold at a profit. The expansion of the manufacturing sector will also have the multiplier effect of increase of employment in other sectors of the economy like agriculture, mining and the tertiary service sector. Thus the continued growth of the manufacturing industries is both a morally and socially responsible objective for the achievement of stability, strength and prosperity of the nation.

Viewed in this perspective chemical industry assumes great importance as a sphere of national economy. Its characteristics of rapid growth, high dependence on research and development, rapid obsolescence of technology, dynamic fluctuations in demand and supply, intense competition and environmental impact endow the sector with vast potential for expansion of challenging job opportunities, creation of wealth and rise in standard of living. It is a pity that these valuable and vast opportunities are lost in Kerala by the tardy progress of this sector.

Kerala is unique in several respects. The traditional Indian village does not exist here. The entire state may be considered as a large small town or a conglomeration of small towns. Other distinguishing features are high incidence of unemployment among the educated, high literacy, low per capita income, political hyperactivity and high quality of life indices comparable in some respects to advanced developed regions of the world. There is also the conspicuous absence of the vigorous industrial enterprise culture manifested in the metropolitan centres of the country. It is, therefore, necessary to examine and analyse the inter-relationships of all the factors of production like land, labour, raw-materials, capital, technology and Governmental policies responsible for the current state of affairs, At the outset I shall highlight some of the repercussions of Governmental policy on an industrial chemical venture with which I had been associated. Permit me to stress here that this narration is not an attempt to convert the forum for ventilation of a private grievance. On the contrary it is hoped that the facts would cause change in policies favouring industrial progress and profitable operation. Western India Plywoods Ltd. established production facilpowder (DAP) with a capital investment of nearly Rs lakhs. The product is an important plastic used in electrics for making connectors and switches. Our technology of indigenous origin and the plant successfully product material conforming to international standards. The product requirement of the material by electronics industry entirely met by imports. Our product equal in quality imported product was also cheaper. Substantial sale to consumers was possible and the future looked bright we potential for total import substitution.

At this juncture, because of the pressures and pulls frimporters, a liberalised import policy came into force in 1 reducing the customs duty on imported material from to 47.25%. This had the disastrous consequence of makimported DAP cheaper than the indigenous product. Tresulted in a serious setback to our production.

We appealed to the Govt. to reduce the Central Excise D on our product to make our price competitive with important material. After a spell of correspondence this was grant for restricted area of use of DAP. Thus our product those equal in quality was competitive with imported material of for restricted use. The major requirement of the product still met by imports. We have again represented the mafor relief but no favourable response has been obtained

It is thus an instance of indigenous chemical development programme thwarted by fiscal policy of the Government on the one hand indigenous technological development a its commercialisation are encouraged by various incentive. On the other hand the successful fruition of these efforts prevented by vagaries of import policy undermining morale of the entrepreneur. This is one of the tribulations of has to encounter due to inconsistency in Government policy.

Now reverting back to the other aspects of industrial che ical progress in Kerala the overiding consideration must given to raw material base and land. Kerala is not gifted a coal, gas or petroleum resources necessary for the growth petrochemical industry. Land in Kerala is extremely precipand large area required for giant chemical factories extremely difficult to acquire. The Bhopal disaster has claim indicated the grave dangers of having human habitations of to the production facilities. Thus large factories should his sizable buffer zones also to minimise adverse effects due environmental impact and industrial accidents. Condition the state are not favourable for these requirements. On

Paper presented at the Seminar on Potentials, Problems and Constraints for Growth of Chemical Industries in Kerala, organised by Chemical Industries Association, KSIDC and Institute of Chemical Engineers, Trivandrum on 18-2-1989

rary a large number of technologically intensive small nical firms is an attractive alternative compatible with jualities of the human resource of the state. The high techgy component required for these operations have to be nged by licensing agreements with overseas firms. The e internal market in India and South Asia with low labour , infrastructural facilities and absence of language barcould be inducements for the foreign supplier of know-. In all these agreements it is desirable to conclude the aboration terms on royalty basis only, avoiding lumpsum ment for technical know-how. Even capital participation he foreign firm should be encouraged subject to the laws ne country. This would enable the mushrooming of large ber of small companies with minimal capital investment prospect for long term successful commercial operation. very case it is to be clearly ascertained that indigenous nology is unavailable.

ased on these considerations I should like to propose a schemes taking into account the raw material availabilen Kerala:

mones & Enzymes

arge amount of slaughter-house waste is available in the unutilized or underutilized. This can be the source mater-or the preparation of large number of hormones and mes used in medicine. Hormones are exemplified by arin, Oxytocin, Vasopressin, ACTH and growth Horze. Technology for the extraction of the hormones may vailable in some cases in the country. In other cases are has to be taken to foreign know-how on the terms tested above.

Enzymes are illustrated by Pancreatin, Proteases etc. They application both in medicine and food industries.

nother interesting item is protein hydrolysate to be used tritional supplement.

iality Chemicals

rge number of chemicals used in small quantities in see sectors of manufacturing industry are grouped ner under this head. They are characterised by large aditure involved in their development, the technologitensity and complexity of production. They are also susple to high rate of obsolescence. The successful appment and manufacture of these high technology proprese undertaken by small firms in advanced countries are targets for take-over bids by giant multinationals.

firms may find tie-up with their counterparts in the 'World as opportunities for survival and growth. In this ular field, organic titanium compounds and titanium are of special interest because of well-established titan-

ium complexes in the state.

Biotechnology

Products of this high technology area are being introduced into the world of medicine. Tissue Plasminogen Activator, Human growth Hormone and various monoclonal antibodies have already acquired marketability. It will be a challenging opportunity to initiate the production of these technologically intensive valuable products by using foreign technical knowhow.

Speciality Rubbers

Kerala being the largest producer of rubber in India has an advantage for ventures to manufacture of speciality rubbers. These value added products with great industrial potential offer attractive opportunity for forward growth.

Epoxidised Rubber

Epoxidation of latex results in a product of improved strength, oil resistance, high damping or air impermeability. Different degrees of epoxidation can be achieved by the control of epoxidation reaction. These products can be substitutes for imported speciality rubbers used in tyre manufacture and other applications. Ability to tailor the properties of the product enables the preparation of a range of products suitable for diverse applications. Thus down-stream processing of latex results in obtaining greater value from the rawmaterial available.

Thermoplastic Rubber

Thermoplastic rubber is another interesting item made by blending polypropylene with natural rubber. They have good cost/performance profile comparing favourably with synthetic counterparts. These products do not require vulcanization. Finished products can be made on plastic processing machinery. Injection moulding and extrusion are possible. Footwear, sports goods, car bumpers, connectors and plugs, industrial floor tiles etc. are the applications.

To summarise, there are enough opportunities for development of chemical industrial units in the state using locally available raw materials. The technology required for some processing may have to be acquired from overseas. The skill of the entrepreneur lies in the choice of appropriate technology and concluding collaboration agreements on royalty basis only which will prevent the outflow of appreciable foreign exchange. Such units designed for export markets will be a great asset to the economy. It is hope that these ideas would become some of the pathways of industrialization of the state.

It gives me great happiness to conclude this address with the optimistic note that chemistry can still make varied and interesting contributions to the economic growth of the state. For Your Requirements of:

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digenous catalyst technology for ethanol based chemicals *

M.S. CHHABRA & S.R. NAIDU

Department of Catalyst Development, Projects & Development India Ltd. Sindri, Dhanbad, Bihar.

oduction

nere are several important ethanol based chemicals which produced by catalytic processes. Some of these are catched dehydrogenation, hydrogenation, dehydration, oxidation and polymerisation reactions which are for production of plastics, rubber and high grade polars derived from ethanol. Butadiene, for example, a startmaterial for synthetic rubber, is obtained by simultaneous adrogenation and dehydration of ethyl alcohol over alum-on-silica type catalyst (1). Similarly, acetaldehyde this used for manufacturing a number of organic chemics, is obtained by catalytic oxidation or catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic of ethyl alcohol over silver or copper-on-silica catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic oxidation or catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic oxidation or catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic oxidation or catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic oxidation or catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic oxidation or catalytic dehydrogenation of ethyl alcohol over silver or copper-on-silica catalytic oxidation or catalytic oxidation or catalytic dehydrogenatic dehydrogenation or catalytic oxidation or catalytic oxidation or catalytic dehydrogenatic dehydrogenation or catalytic oxidation or catalytic dehydrogenatic dehydrogena

alyst (2,3). Activated alumina, silica-aluminas and activated clays are used for producing ethylene from ethanol(4) which is a major building block for plastics. Styrene, vinyl acetate, ethylene chloride, ethylene glycol and Vinyl acetate monomer which may be termed as secondary derivatives of ethanol are also produced by catalytic processes. Polymerisation of olefins (5) is also a catalytic process. Major catalysts used in the ethanol based chemical industry are listed below in Table-I.

Need for Indigenous R & D in Catalyst Technology

It should be remembered that before the advent of the

Table-1

PRINCIPAL CATALYTIC REACTIONS AND CATALYSTS USED IN ETHYL ALCOHOL BASED CHEMICAL INDUSTRY

Reactions	End Product	Catalysts	Temp °C	action condition Press (atm.)	Phase
CHYDROGENATION	· · · · · · · · · · · · · · · · · · ·				
OH¥CH ₃ CHO + H ₂	Acetaldehyde	CuO or CuO- Cr ₂ O ₃	210-330	• 1:	vapour
C ₂ H ₅ C ₆ H ₅ CH=CH ₂ + H ₂ LIDATION	Styrene	Fe ₂ O ₃ /Cr ₂ O ₃ /K ₂ O	580-630	, 1 Car	vapour
OH + 1/20, + N,+CH, CHO + C, H, OH + N,	Acetaldehyde	Ag screen	520	1 100 100 100	vapour
но+ 1/2 о ₂ усн ₃ соон	Acetic Acid	Manganese ace-	55-65	A.5	liquid
OOH + CH,COOH(CH,CO),O + H,O	Ac. anhydride	Cobalt Acetate	60	6-7	liquid
OH>C ₂ H ₄ + 1/2O ₂ DROGENATION	Ethylene Oxide	Silver	250-325	10-30	vapour
H=CHCHO + 2H ₂ >C ₄ H ₉ OH	n-butanol	Copper-silica or nickel-alumina	133-180		vapour
H ₂ CH ₂ CHO + H ₂ 3CH ₃ CH ₂ CH ₂ CH ₂ CH (C ₂	2-Ethyl hexanol	nickel-chromia-	200-300	1	vapour
IOH HYDRATION		alumina			
)H>C ₂ H ₅ OC ₂ H ₅ + H ₂ O	Diethyl ether	alumina or alu- mino-silicate	200-300	moderate	vapour
H + NH,,C,H,NH, + H,O	Ethyl amine	act. alumina	250-500	1	vapour
H	Ethylene	act. alumina	300-400		yapour
H + CH ₃ COOH3CH ₃ COOC ₂ H ₅ + H ₂ O	Ethyl acetate	Copper oxide with promoter cation exchanger	200-300		vapour liquid
KYLATION					
- C ₆ H ₆ >C ₆ H ₅ C ₂ H ₅	Ethyl benzene	AlCl ₂ -Hcl- hydrocarbon	40-100	100	liquid
.YMERISATION	9				
·	Polyethylene HDPE & LDPE	TiCl ₄ + AlR ₃ or Cr ₂ O ₃ or per	70 80-300	20-30 30-1000	
HYDROGENATION-DEHYDRATION H + CH ₃ CHO CH ₂ =CHCH=CH ₂ + H ₂ O	Butadiene	Tantalum-Silica	325-350	1	vapour
	and the same and t	AND DESCRIPTION OF THE PROPERTY OF THE PROPERT	The second secon	the same of the sa	

taper presented at the seminar on ALCOHOL BASED INDUSTRIES IN THE NINETIES organised by AABIDA at Vigyaa Bhavan New this on May 11, 1989.

modern "Petrochemical Era", most of the above mentioned basic chemicals were produced, the world over, from ethanol. But the technology was non-catalytic and whatever little catalytic technology was developed prior to this era has now become obsolete. Giant petrochemical plants are today almost threatening to wipe out the ethanol based industry, if the latter do not brace-up with modern technologies particularly by developing and using more active and selective catalysts. All the ethanol based units operating in the country, are at the mercy of the foreign process licensors or other foreign suppliers for the supply of catalysts. If they stop supplying catalysts these units, which are already plagued by the "ethanol scarcity", will be forced to close down. Therefore if the ethanol based industry is to survive and fluorish, concerted efforts must be made to promote and develop indigenous catalyst technology. It should also be borne in mind that ethanol, being a principal renewable feedstock, is bound to ressurect itself in the future when the fossil fuel based feed stocks, which are not unlimited will recede into oblivion. Both the catalyst users and indigenous catalyst manufacturers must join hands in this effort in their own mutual interest.

Status of indigenous effort

Experience shows that lack of sponsorship is proving to be a major stumbling block in indigenous R & D work towards development of catalysts used in the alcohol based industry. Projects & Developments India Ltd. PDIL, a public sector company has made a modest beginning in the development and manufacture of some of the catalysts used in this industry. Some of these catalysts are being manufactured and marketed and some are awaiting commercialisation, while some are at different stages of development.

PDIL's venture into the area of catalysts for ethanol based chemicals began with users' demand for catalysts for ethanol ketonization, ethanol dehydrogenation and hydrogenation of crotonaldehyde. The latter two catalysts, required in the manufacture of n-Butanol, were developed under time bound programme at users request and supplied to them. This development took place with their active participation in side stream testing before commercialisation. Another prospective user has come forward to extend help in evaluating PDIL's Styrene catalyst (dehydrogenation of ethyl benzene) in a side stream pilot plant setup.

PDIL is always ready to take up challenges in catalyst development and welcomes sponsorship and co-operation from users in translating the laboratory and pilot scale developments into commercial reality. A brief description of catalysts developed by PDIL for ethanol based chemicals and their status is given below:

Acetaldehyde from Ethanol

Acetaldehyde is an important starting material for man-

ufacturing industrially important chemicals like acetic n-butanol, 2-ethyl hexanol and butadiene etc. Acetald can be obtained by vapour phase catalytic oxidated dehydrogenation of ethanol over supported silver or catalysts respectively. Dehydrogenation is, however, the erred route because the hydrogen obtained as a valuable product can be further utilised in the hydrogenation of a stream crotonaldehyde in the manufacture of n-butano catalytic dehydrogenation is effected over copper-one or copper-chromia-silica catalyst at 200-300°C. The camust be highly selective to avoid side reactions and shave good regenerability.

$$C_2H_5OH --- CH_3CHO + H_2 -12 kcal.$$

PDIL has developed the copper-on-silica type ca which is in the market since 1975. Physical character and typical plant performance data of this catalyst are slin Table-2.

Table-2

CATALYST FOR ACETALDEHYDE FROM ETHANOL Type: Copper-on-silica; Shape & Size: Tablets 10mm x 6mm; Bull sity: 0.65-0.7 g/cc; Crush Strength: 80-90Kg/cm²; B.E.T. Surface 70-80 m²/g; Porosity 70-75% v/v

Typical Plant Performance Data: Reactor: Tubular Volume: 2M ³				
Operation period months	Reactor Temp.	LHSV hr ⁻¹	Acetaldehyd produced, M	
4	200-205	1.0	306.34	
8	205-215	1.0	617.20	
12	215-225	1.0	612.75	
16	225-236	1.0	574.02	
21	235-260	1.0	880 20	
		Total	2990.51	

n-Butanol from Crotonaldehyde

n-Butanol is used as a solvent and in the manufacture pharmaceuticals, plasticizer and butyl acetate acrylate. manufactured either by hydrogenation of crotonalde (ethanol route) or by the so called Oxo Process (proproute). The ethanol route is commonly practised in I Crotonaldehyde vapour and hydrogen in the ratio of 1:1 passed over copper-silica catalyst at 145-175°C to on-butanol.

$$C_3H_5CHO + 2H_2 --- C_4H_9OH + 35 kcal.$$

PDIL has developed the copper-on-silica hydrogenation alyst suitable for this reaction and it is in commercial since 1976. Physical characteristics and typical plant per ance data of this catalyst are shown in Table-3.

Table-3

ATALYST FOR n-BUTANOL FROM CROTONALDEHYDE

Copper-on-silica; Shape & Size; tablets, 10mm x 6mm; Bulk Den-0.6-0.65 g/cc: Crush Strength :60-65 kg/cm²; B.E.T. Surface Area: m²/g

1 Plant	performance	e Data
---------	-------------	--------

of operation	Reaction Temp ^o C	Conversion %
	•	
	145	99.85
	152	97.0
	152	97.20
	154	96.20
	160	93.40

lene from Ethanol

hylene is the building block in the manufacture of polylene, polyvinyl chloride, styrene and ethylene glycol. chemical is, these days largely produced by the pyrolof petroleum fractions like naphtha and kerosene. Howethylene is also obtained in excellent yields with high tivity by catalytic dehydration of ethanol. Ethanol dehyon is effected over specially prepared alumina or silica ina catalyst in the range of 300-400°C.

$$C_2H_5OH --- C_2H_4 + H_2O -- 7.2 \text{ kcal.}$$

IL has developed both active alumina and silica-alumina catalysts for ethanol dehydration. Evaluation of these *sts in side stream and commercial trials are awaited. cal characteristics as well as laboratory scale activity *s are shown in Table-4.

Table-4

CATALYSTS FOR ETHYLENE FROM ETHANOL

Activated alumina and Silica-alumina; Shape & Size: globules; 3-5; Bulk Density: 0.60-0.65 g/cc; Crush Load: 5-7 kg. B.E.T. Surface 40-250 m²/g; Porosity: 65-70% v/v

Acti	vity Data			
of 	Reaction temp °C	LHSV hr1	Conversion percent	Ethylene purity %
e alu	mina (Lab da	ıta):		
	340	0.8	79.6	99
	345	0.8	77.3	99
	350 .	0.8	91.3	. 99
u-alu	mina (pilot p	lant data):		
	330	0.2	98.72	
,	330	0.2	98.14	-
2	330	0.2	95.77	e0
V.				

Acetone from Ethanol

Acetone is used as solvent and in the manufacture of pharmaceuticals, surface coatings, cellulose acetate, methacrylate and methacrylic acid. It is produced either by dehydrogenation of isopropyl alcohol obtained by dehydration of propylene or by decomposition of cumene isopropoxide as a co-product in the manufacture of phenol. However, catalytic ketonization of ethanol, in the presence of steam, is another very important route for manufacturing special grade acetone. The reaction can be shown as follows:

$$2C_2H_5OH + H_2O --- CH_3COCH_3 + CO_2 + 4H_2$$

PDIL has developed a catalyst comprising Fe₂O₃-ZnO-CaO for ethanol ketonization to acetone in the presence of steam. This catalyst is awaiting commercialisation. Physical properties and typical laboratory test data are shown in Table-5.

Table-5

KETONIZATION CATALYST (ACETONE FROM ETHANOL)
Type: ZnO/Fe₂O₃/CaO; Shape & Size: 1" x 1" extrudate or 1" dia balls;
Bulk density: 1.4 g/cc; B.E.T. Surface area: 20-24 m²/g

Period of run hours	Reaction temp °C	LHSV hr ⁻¹	Ethan ol/Wa-	Conversion %	Aceto- ne sel- ectivity
5	450	2.0	70/30	100	95
25	450	2.0	70/30	100	95
50	450	2.0	70/30	100	90

Catalyst for styrene from ethyl benzene

Styrene is commercially manufactured by the vapour phase catalytic dehydrogenation of ethyl benzene in the presence of steam over Fe₂O₃-Cr₂O₃K₂O type catalyst in the region of 580-630°C. The reaction is as follows:

$$C_6H_5CH_2CH_3 - - C_6H_5CH = CH_2 + H_2$$

However, in ethyl benzene dehydrogenation, there are several side reactions giving rise to undesirable by-products, mainly toluene and benzene which determine the styrene selectivity of the catalyst. Single pass conversion and styrene selectivity typically obtained in commercial plants are 40-50 and 90-95 percent respectively.

PDIL has developed the catalyst for this reaction which compares favourably in laboratory evaluation with proven commercial catalysts in respect of single pass conversion, selectivity and stability. Pilot plant evaluations are awaited. Typical laboratory activity data and physical properties are given in Table-6.

Table-6

CATALYST FOR ETHYLBENZENE DEHYDROGENATION TO STY-RENE

Type Fe₂O₃/Cr₂O₃/K₂O/Al₂O₃ Shape & Size; Tablets 6 mm x 6 mm; Bulk density: 1.2 g/cc; B.E.T, Surface area: 12-15 m²/g

Period hours	Activity data (la Reaction temp°C	LHSV hr 1	Steam/ EtB	Convers-	Select- ivity %
5	520-25	0.4	2.0	49.25	97.2
15	530-40	0.4	2.0	52.34	97.0
30	540-45	0.4	2.0	47.19	95.8
50	550-55	0.4	2.0	50.99	94.7
100	545-555	0.4	2.0	54.39	96.0

Conclusion

It is evident that the catalysts for ketonization (acetone from ethanol), dehydration (ethylene from ethanol), and also dehydrogenation (styrene from ethyl benzene) developed indigenously have been languishing in the laboratory for want of sponsorship and co-operation from the user industry without which the goal of self-reliance in this area cannot be achieved. Further, in view of the importance of ethanol based industry as already discussed, this industry should be recognised as a national priority and proper atmosphere should be created for the development of improved catalyst and process technologies indigenously to take care of the future

requirements. PDIL will be too eager to join in any such venture with its vast experience in industrial alyst development, manufacture and marketing as well as its engineering backup.

PDIL's capabilities in the field of fertilizer catalysts been thoroughly proved and established by its products it used by the industry for about three decades. And come cial experience has shown that PDIL products are contable in performance to the best available in the internat market. However, there appears to be some hesitation of part of the user, in trying out new products particularly for non-fertilizer chemicals, on the plea that they have been tried and proven commercially. The users should appear that commercial proving can never take place with their active cooperation. After all they also have a post role to play in these national efforts towards self-relia

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Chemical News from Abroad

NISH FERTILISER FIRMS OSE TO MERGER ACCORD

pain's main fertilizer companies, the rate group Fesa and state owned ersa are on the verge of merging. two companies are poised to sign reliminary agreement committing inselves to establishing a single continuity of industry.

to the rationalisation programme ch has been necessary to make mish firms more competitive.

The new company will operate 24 ats all over the country and would able to boast a turnover of some Pta-120bn (\$944m-953m). About two is of this turnover would come from the Fesa operations.

according to sources at Ercros, the ent group of Fesa, the agreement "is a compromise of both parties to set a single manufacturing group opergunder a single management". This magement, however, is likely to end in the hands of Fesa.

To date has yet been set for the offisigning of the deal but negotiations complete and the final documentais now being prepared. Once the is signed there is the possibility that the manufacturing facilities will be

has been reported that the shutdown facilities with total capacity for ,000 ton/year NPK is being recomded and has been agreed by the unions. This closure programme ald involve the closure of six facilbetween now and 1991.

regotiations have been held up by assessment of each company's indulated the value. These assessments have a conducted by Goldman Sachs for INI and Sears for Ercros. The conclusion is that Fesa is to be assigned two thirds of the new company and Enfersa the remaining third.

Nevertheless, these shares could be altered if some other partner, whether Spanish or other, is admitted into the new concern. To this end, the acceptance of a third technological partner is being considered, as is the possible acquisition of a basic raw materials manufacturer.

The new company is to be established as a joint venture of all Fesa's and Enfersa's industrial assets. This is likely to bring considerable cost savings, estimated to be as much as Pta4bn in 1990, from lower transport and distribution costs. The Spanish industry has undoubtedly played an active role in speeding up the decision to bring the Spanish rationalisation to a close and thus avoid additional losses of domestic market share.

In 1988, total fertiliser usage grew 12 per cent on the previous year to 1.49 m ton. These imports now account for about 27 per cent of the domestic market. In 1987, imports amounted to only 22 per cent of Spanish consumption.

Potential closure targets

Site	Capacity (ton/year)	Owner	Closure
Madrid	120,000	Cros	: 1989
Valencia	120,000	Cros	1989
Mongad	100,000	ERT	1989
La Coruna	120,000	Cros	1990
La Felguera	149,000	ERT	1990
Merida	120,000	Cros	1991

CHAMBERLAIN BACKS EVODE BID

Chamberlain Phipps is once again recommending an Evode bid to its share holders in the latest step in the battle between Evode and Bowater Industries

to acquire the adhesives and laminates concern. Both firms revised their offers for the UK company on 28 April. Although the bids are close, the board of Chamberlain Phipps is persuaded by the strong commercial logic of the Evode offer.

Bowater came up with a final offer at the last moment on April 28 of 230 pence a share from 220, giving the business a value of £86.6m. Minutes later Evode replied raising its offer to six new Evode shares and 11 new Evode convertible shares for every Chamberlain share. This values Chamberlain Phipps shares at 234 pence or a total of £88.2m.

Evode now has a 14.9 per cent stake in the concern, the limit it can buy with cash because its offer is not a cash bid. Meanwhile, Bowater owns or has received acceptances for 18.6 per cent of ordinary shares outstanding. The company can take its stake to 29.9 per cent because of its cash bid.

David Winterbottom, Evode group managing director, says there is a great deal of synergy between Evode and Chamberlain. 'Immediately there would be £3.5m worth of benefits in bringing the companies together. This would not just come from savings because of size, it would be the integration of the product lines, and the fact that all our product areas overlap."

Meanwhile, David Lyon of Bowater said: "The Evode offer is only theoretical and based on the value of the paper it is offering. The fight is relatively close but we believe our cash offer of 230 pence betters their paper offer and that is how we think the shareholders will view it. Evode is now offering some 85 per cent of their ordinary equity, which is a huge amount for them."

DYNO ACQUIRES GERMAN GROUP

Dyno Industrier, the Norweigian diversified chemicals group, has acquired

the West German plastics group, Elbatainer. The acquisition boosts Dyno's presence in the European market and will raise its turnover by about 30 per cent to NKr1.05 bn (\$154m).

Elbatainer develops and produces plastic components for car makers such as Daimler-Benz, Peugeot and Renault. The West German firm, which also produces a wide range of plastic packaging products, has operations in West Germany, France, Spain, Italy and the UK.

Before the acquisition, Dyno had production efforts for the car sector in Norway, Finland and the UK. Commenting on the acquisition, a company spokesman said: "The takeover of Elbatainer represents a considerable strengthening of the corporation's market position on the European continent."

FOURTOU REJECTS FRENCH TIE UPS

Rohne-Poulenc is unlikely to be involved in the potential restructuring of the French chemical industry. It has been rumoured that a report by Loik le Floch-Prigent, commissioned by the French government, may propose that Rhone-Poulenc links with Elf Aquitaine's Sanofi to market drugs in the US, and with Orkem and Atochem in other projects. Jean-Rene Fourtou, company president, believes the company has gone through its rationalisation. "There are no chances of tie ups with other French firms," he addea. Moreover, Fourtou is clear the firm will not reenter petrochemicals, fertilisers and polymers.

BOC REOPENS TALKS

BOC group, the UK industrial gases outfit will re-open negotiations with UGI of the US over the proposed \$171, acquisition of the US firm's subsidiary Americas. This follows the decision by the US department of justice's anti-tudivision to oppose the acquisition move.

The department of justice has objected to the proposed transaction "as filed". The objections apply to the supply of liquid carbon dioxide on the Texas Gulf coast and of industrial gases in northern California and the Chicago-Milwaukee corridor.

A BOC spokesman added: "UGI and ourselves are now looking to develop mutual variations that will be acceptable to the US department of justice." BOC is interested in Amerigas' position in the Mid West and the Rockies where the UK company is under represented. The two firms will probably have to work out a new price for the company.

STERLING TARGETS FERTI-LISER FIRMS, ACQUIRES ARCADIAN

Leveraged buyout (LBO) expert Gordon Cain, Chairman of the Sterling Group has switched attention to the fertiliser business with the acquisition of US N-fertiliser producer Arcadian. Sterling has formed an LBO group with Unicom Venture Funds cailed Fertilizer Industries Inc. which has acquired AAC Holdings, parent company of Arcadian and Triazone Corp. Terms were not disclosed, although combined sales of Arcadian and Triazone are put at over \$200 m/year.

The deal is seen as particularly significant, in that it marks the unusual step of a chemical group moving into the fertiliser business. In recent years the opposite has been true, with a number of famous names like WR Grace and IMC Fertiliser quitting the sector.

"The US fertiliser industry is still in some disarray", according to William Tittle, principal at consultant Chem Systems. "A number of businesses like Arcadian have been up for sale for some time, but the main problem has been a shortage of buyers."

Headquartered in Morris County, New Jersey, Arcadian has manufacturing plants at Geismar, Louisiana LaPlatte, Nebraska. The Geismar has a capacity of 340 000 ton ammonia, 240 000 ton/year ammorphosphate and 160 000 ton/year phoric acid.

The LaPlatte operation has a cality of 180 000 ton/year of ammonia addition, Arcadian also has an idled 000 ton/year ammonia unit at He Arkansas which ceased operatio October last year, although the fututhis unit is not yet clear.

Arcadian CEO and President Her Kirby stated that no major change the corporation's management employees are expected. Gordon C Sterling chairman added: "Arcadia an excellent company and we are leing forward to working with it".

As the US fertiliser sector begin recover it is clear that more compa could become the target of LBO takeovers. Sterling itself is tipped to considering further acquisitions of sources saying the most likely canditised is Columbia Nitrogen which has no gen fertiliser operations at Augu Georgia.

UNILEVER DUMPS FABERGI BID

Unilever is no longer buying the sonal products of Faberge and Elizeth Arden following the termination negotiations between Riklis Far Corporation and the Anglo-Dutch cialities major.

An agreement in principle between the two firms, which valued the benesses at \$1.55bn, was signed or February this year subject to a detive agreement in 90 days. Howe several weeks into the negotiations Riklis Family Corp proposed charing the structure and legal aspects of deal which, according to Unilever, siderably increased the cost of the templated deal.

nilever chairman, Michael Angus "At the agreed price the acquisiof Faberge and Elizabeth Arden
ld have been an important step ford in our strategy for personal pros. They now appear to be available
with a construction and price
ch do not represent reasonable value
our shareholders. This is annoying,
there are alternative ways of achievour strategic objective and we will
sue these vigourously."

the businesses in question earned in less of \$100m last year according to lis, and involved toiletries, cosmeand fragrances. Daniel Manella rman, and CEO of Faberge said: le don't intend to offer the company my other buyer. In fact we are curily negotiating to buy a cosmetics pany and fragrances company."

URTAULDS ACQUIRES US

ourtaulds, the UK-based textiles chemicals group, has paid \$21.7m 110.5 per cent stake in the US spety polymers company, Products earch & Chemical Corp. (PRC). move is in line with Courtauld's egy to build up a downstream micals portfolio with the acquisition technology. Sipko Huismans, rtaulds director responsible for the nicals & industrials group said: is move will not only provide us opportunities to strengthen our ing downstream operations but will facilitate our expansion into adjabusiness areas."

C, which makes speciality polymor the adhesives, sealants and coatmarkets, reported 1988 full year of \$100.2m and earnings of \$8.1m. companies are already planning to flop areas of mutual interest.

DOZ RESTRUCTURES, ORTS STRONG Q1

undoz, the Swiss chemicals group, posted record first quarter results

and announced plans to restructure the company. The restructuring of the company, under a new holding company, is to protect it from predators, according to company chairman Marc Moret.

Moret revealed that the first quarter results carry on from the excellent results seen last year. Sales sky rocketed some 32 per cent, in comparison to the 1988 first quarter, to hit SF3.3bn (\$2bn). All divisions contributed to this record result with the agrochemicals, construction chemicals and seeds businesses leading the way.

Under the terms of the restructuring deal, the present chemicals, pharmaceuticals, agro and seeds divisions of the parent company Sandoz Ltd. will be reconstituted as self sufficient units from 1 January 1990. Sandoz Ltd. will act as a holding company for all these units.

The company is proposing that shareholders accept several amendments of its byelaws to counter the risk of hostile takeovers. One proposal, to be considered by a shareholders meeting this month, will mean that future changes to company byelaws will require 75 per cent acceptance and the attendance of more than half the shareholders.

GOODRICH AGREES CALVERT CITY SALE

BF Goodrich has reached an agreement with the Federal trade commission which requires the sale within the next 12 months of the US firm's Calvert City, Kentucky-based vinyl chloride monomer facility. This terminates litigation between BF Goodrich and the FTC regarding the firm's purchase of a VCM facility in Houston, Texas in 1982. The company intends to retain ownership of the rest of the Calvert City site, which includes chloralkali, ethylene and speciality chemicals manufacturing units. BF Goodrich expects to buy a significant proportion of the facility's VCM output.

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Chemical Markets Abroad

VAM SUPPLIES TIGHTEN AS MAINTENANCE CLOSURES LOOM

Vinyl Acetate Monomer (VAM) is undergoing a period of tightness in supply, after a general easing earlier in the year. A series of maintenance shutdowns and debottlenecking work have removed capacity from the market and mopped up any surpluses.

The lengthening of supplies at the end of the first quarter this year was reflected in contract negotiations for Q2. After lengthy discussions, contracts were eventually settled at DM1,880-1,940/ton, representing a slight fall on the previous quarter. One explanation for the increased supply and drifting contracts said one player, was that: "Producers overprepared for the shutdowns of Q2 and left the market temporarily awash with product."

The maintenance turnarounds, which involve catalyst replacements and debottlenecking, include Hoechst's 140,000 ton/year plant at Frankfurt, which is undergoing a revamp that should see capacity rise by 40,000 ton/year. Work on the Hoechst plant began in early April and should be completed by the end of May. Montedipe is believed to be undergoing catalyst replacement at the 55,000 ton/year Porto Marghera unit which will halt production for most of May. BP's Baglan Bay plant, meanwhile, which produces 85,000 ton/ year of the product, is undergoing an outage for 1 month beginning May 19.

Acetic acid feedstock for VAM appears to be well balanced, although two events could alter this: first BP is in start-up a new 175,000 ton/year acetic acid unit at Hull by the third quarter, and Hoechst Celanese has make the plant which is a fire and explanation of the start a fire and explanation.

Market observers feel the new acetic acid capacity will not have an adverse effect on the market, at least in the short-term. The majority of material coming out of the Pampa plant will be used to fulfill contracts. It is believed that Borden Chemicals' 70,000 ton/year unit, de-mothballed in January 1988 when acetic acid supplies were tight, will now be shutdown again.

Acetic acid from the BP Hull unit is to be used mainly for contracts and back integration. Although no short-term effects of improved acetic acid supplies are predicted, some observers feel that by the fourth quarter, cheaper feedstock could put downward pressure on VAM.

Meanwhile, in a separate move the EC commission has decided to review anti-dumping measures taken against US and Canadian VAM producers. Originally, definitive duties against US companies were applied in 1981, and amended and updated in 1986-87. Canadian companies, meanwhile had definitive duties imposed in 1984 and revised in 1987.

Quantum Chemical Corp has requested the latest review, arguing that VAM prices in the EC have risen by approximately 77 per cent between March 1987 and September 1988, thus making dumping on a price basis uneconomical, as US domestic prices now compare favourably with those in Europe. The US producer also claims imports no longer hurt the Europe in VAM industry. They argue that estimated production costs against market prices show a healthy profit margin for the EC industry.

the EC commission has decided the it is enough evidence for a review of present procedures. All parties will now submit points of view to the commission and a final decision/ruling is expected within the next six months. One European player commented: "US producers have consistently dumped

VAM in Europe, I'm sure once move into surplus they will do it a I will be disappointed if the dutie removed."

BUTADIENE UNIT STARTS

Italy's Margera Butadiene has st up a new butadiene/raffinate-1 ex tion unit at Porto Marghera. The opany is a joint venture between Enimont's Montedipe subsidiary the Japanese companies Nippon and Mitsui & Co.

The facility can produce 80,000 year of butadiene and 70,000 tone of raffinate-1. It is fed on the crud stream from Enimont's Porto Marg 1 ethylene cracker.

Marghera Butadiene is significate that it is the first petrochemical venture in Italy between Italian and anese partners. The company saysees positive growth prospects for butadiene and raffinate-1.

Consumption of the latter current stands at around 7-8m ton/year are experiencing particularly strong dem growth for its isobutylene content, in the production of MTBE. Alrestightness in the raffinate-1 market prompted increases in contract and prices.

With MTBE demand currently gring at more than 6 per cent/year, in than double that of butadiene, obsers are predicting that extraction nomics could begin to be driver isobutylene from raffinate-1 and lability could have a limiting effect MTBE production.

NOVA DOWNSIZES RED DE CRACKER

Canada's Nova Corp has at decided to go ahead with its plan a third ethylene cracker (AGE3) at Deer, Alberta. However, as pred the size of the project will be cu

iderably from 680,000 ton/year to 000 ton/year, costing some \$500m (\$460m), way below the inal Can\$1bn-plus investment ned by Nova.

ccording to Nova, the reason for the nsizing is not one of feedstock connt, but rather that firm supply const for the larger capacity were not acoming. In particular, the Red Deer ect was derailed when Dow Chemcurrently Nova's main ethylene omer, announced plans last year to dits own 500,000 ton/year cracker ort Saskatchewan, due on stream in

cova had previously put the AGE3 ect on hold following protracted lems over gaining adequate ethane ly from the Alberta gas fields. Inst a previous feedstock need of DO barrel/day, Nova could obtain red supplies of only 37,500 barrel/Feedstock needs for the revised ect are put at round 35,000 barrel/-

Ted Deer plant will be Nova's own acor Chemicals subsidiary and on Carbide. Novacor is planning an at oriented Can\$200m joint venture at Red Deer.

e rest of the output will go to m Carbide Canada, which is adding its monoethylene glycol G) unit at Prentiss, Alberta, to 1000 ton/year and will need a further 1000 ton/year of ethylene by 1992.

ova's existing AGE1 and AGE2 ers at Red Deer have a combined oity of 1.36m ton/year.

w Chemical Canada is to cease action at its 300,000 ton/year ine-caustic unit at Sarnia, Ontario,

at the end of July as a result of falling demand for chlorine. With the closure, Dow will no longer produce anhydrous caustic anywhere in the world.

Following the closure of a number of chloralkali units over the past few years, imports of dry and solution caustic soda have tripled since 1986 to Can\$74.2m (\$62.3m). Production stands at 1.8m ton/year, about 85 per cent of domestic demand.

A growing problem for the industry remains the slackening demand for chlorine from the pulp and paper industry in favour of chlorine dioxide or other means of bleaching. Sustained demand growth for caustic could mean overproduction of chlorine in the 1990s.

CRACKER PROBLEMS ADD TO ETHYLENE SUPPLY WORRIES

An air of nervousness has returned to the ethylene market after a brief period of respite following news of problems at two of Europe's largest crackers the Exxon/Shell 600,000 ton/year Fife ethylene plant at Mossmorran, Scotland, and Atochem's 400,000 ton/year unit at Gonfreville, France.

The Mossmorran cracker, Europe's third largest ethylene unit, was put out of action on 27 April following the closure of Shell's St Fergus North Sea gas terminal near Aberdeen, which supplies its natural gas liquids (NGLs). Cracks were found in the terminal's drier regeneration system.

The St Fergus closure halted supplies of NGLs to the Shell/Exxon extraction plant at Mossmorran which supplies ethane feedstock for the cracker. However, after the affected part of the terminal year had been isolated, Shell was able to resume reduced NGL deliveries

The cracker was able to restart operations at reduced rate on 2 May and is now expected to be operating at around 50 per cent of capacity for at least two

weeks whilst repairs to the St Fergus operation are completed. Shell is covering its immediate needs from the Holford ethylene storage cavern on the UK trans-Pennine pipeline.

For Shell, the problem is intensified because its other major cracker, the 525,000 ton/year unit at Moerdijk in the Netherlands is currently down for maintenance work until mid-May. Both Shell and Exxon may now need to swap or purchase ethylene to cover the shortfall, and Exxon may need to further reduce shipments to its US terminal.

In France, meanwhile, Atochem lost two days production at its Gonfreville site following industrial action by workers there. The cracker and downstream units were closed on 28 April, but were able to restart two days later. However, sources do not rule out the likelihood of more problems this week.

Unfortunately, players looking to purchase material on the spot market could find themselves out of luck. Product offered from Mexico for early May has now been snapped up and the only other material on offer is from Turkey which is offering a 2,000 ton parcel at around \$840/ton fob Aliaga (about \$940/ton cif NWE).

However, most buyers have so far turned their noses up, and still appear reluctant to pay over \$900/ton cif NWE for spot material. Sources still believe prices could move up, since exotic product expected to be offered in the Med during May has yet to materialise.

Meanwhile, the propylene market appears to be bottoming out at around DM950-970/ton cif NWE for chemical grade. Supply of product has been tightening sharply and current availability is confined to very poor quality product from Turkey which has been traded at around DM900/ton cif Med. Demand for polymer grade remains strong and spot prices are holding firm at DM1,140-1,160/ton cif NWE.

There are no early indications of likely movements for contract prices in the third quarter, although evidence of the downward sentiment in the propylene market is already being seen in monthly prices.

Although Shell has managed to keep some May prices steady at DM1,050/ton FD, some contracts have been revised down to DM1,045/ton FD, some way below the quarterly price of DM1,060/ton FD.

ITALY UPS CHEMICAL OUTPUT

Chemical output in Italy shot up 6.6 per cent in 1988, far outstripping the previous year's growth rate of 2.3 per cent, according to the chemical industry association Federchimica. The increase in growth was fuelled by a 6-7 per cent growth in domestic demand aand a 9-10 per cent increase in overseas demand. Total chemical sales increased by 14.5 per cent to L55.7 trillion (\$40bn).

However, there was less good news for Italy's balance of trade in chemicals. The deficit climbed to L8 trillion, L1 trillion worse than the 1987 figure. Federchimica attributed this to secondary chemicals and pharmaceuticals, with each contributing some L500bn to the deficit.

Giorgio Porta, recently confirmed as head of Federchimica, said that for the first time exports grew faster than imports, a trend which the association forecasts will last well into 1989. Exports increased 17.8 per cent to L14.2 trillion (against 5.2 per cent in 1987), whilst imports increased 17 per cent to L22.2 trillion (6.5 per cent).

Primary chemicals showed the best performance, with exports rising 26.5 per cent to L6.6 trillion against only a 6.5 per cent increase in 1987.

According to Porta, the trend has changed primarily due to the creation of Enimont, the joint venture between Italy's largest chemical groups Enichem and Montedison, which has opened the way to greater efficiency.

The L2.7 trillion investments for the chemical sector during 1988, up 15 per cent on 1987, have meant a recovery in competitivity, and windfall benefits for the country's balance of trade.

ENL QUITS AMMONIA EXPORT MARKET

Rising feedstock costs have forced Australia's Eastern Nitrogen Ltd. (ENL), a subsidiary of Initec, to quit the ammonia export market. Ironically, the company was responsible for bringing a natural gas pipeline from Sidney to its

operation at Newcastle, NSW. produces 230,000 ton/year of anhyammonia and 230,000 ton/yearmonium nitrate.

Presently, the company is runniplant for five weeks until storage are full and then closing it for weeks.

The majority of ammonia exwere directed towards the Far East ticularly Korea and Taiwan. The East export trade is currently so petitive, with Middle East oil production of the East oil production oil production

Shipments which stood at 50,00 year in 1987, dropped to 30,000 year in 1988 and this year's export not expected to reach 20,000 ton.

In attempt to revive its fortunes, is planning to invest Aus\$27m (\$2 in upgrading its ammonium nitrate duction unit, leading to more am ia being processed into explosive ammonium nitrate, which can be keted domestically to the coal mindustry.

The company hopes to consume ammonia and so reduce storage of while lessening dependence on export market.

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News about New Projects

IPPINES EXECUTIVE S FOR PROJECT RETHINK

Philippines Government is dign to defend a stalled \$320m petnical complex planned by US and nese companies. The project, "is nd will not be a monopoly", red under-secretary of trade and ry Tomas Alcantara.

would have to compete for sales at imports from the US, Europe, and Southeast Asia, he said, in use to charges made by Manuel la the president of state-owned opine National Oil Co. (PNOC) claims that its structure violates provisions. Estrella has called for ernment review of the project and unded the cracker to be owned at 250 per cent by local interests.

rella told a congressional panel, whership structure would "foist a poly over the entire Philippine petmical industry," in violation of the attution.

vinstream plants will be owned by le entity, Bataan Petrochemical nereas in most countries, upstream ownstream operations are separne said.

project is backed by USI Far East d Taiwan's China General Plasprp, and is to have ethylene output ,000 ton/year producing 140,000 ar of polyethylene (PE) and 0 ton/year of polypropylene (PP), nilippines currently has no such ution, and in 1987, according to est figures available, imported ton of PE and 72,000 ton of PP.

and is rising as the Philippines by recovers from years of stagnalicantara said the new project we able to meet demand at first, I probably fall behind after five a manufacturing industry grows.

He stressed that imports of products will continue to ensure that the proposed complex does not gain a stranglehold over industry. The government, "has no intention" to restrict imports.

The government's board of investment, of which Alcantara is a vice chairman remains open to approaches by other investors in the field, the official said, indicating that they would qualify for incentives similar to those granted to Bataan Petrochemical.

Even if petrochemicals are dropped from the investment priority programme, investors will still be allowed to undertake projects in the field without incentives, he pledged. Previously, only projects qualifying for incentives were permitted. Alcantara said the idea of government ownership in the Bataan complex, another suggestion by the oil company, was rejected as unnecessary.

The Taiwan consortium has decided to site the complex in Batangas south of Manila and near a refinery operated by Caltex Philippines, a marketing joint venture between Chevron and Texaco.

The original location, backed by the board of investment, was on the Bataan peninsula west of the capital and near a naphtha producing complex run by PNOC. It is not clear however, whether this loss of potential custom influenced Estrella's demand for a rethink.

DU PONT PLANS INTERMEDIATES UNIT

Du Pont is to build a chlorosulphonic acid unit and expand sulphur trioxide capacity at its Wurtland, Kentucky, US plant. The company now produces the chemicals at its Grasselli plant in Linden, New Jersey. As part of an overall restructuring at Grasselli, its units will be shut down when the Wurtland facilities come on line. Grasselli will continue to produce sulphuric acid,

oleums up to 20 per cent, ammonium thiosulphate and sodium bisulphite, and will also continue to package chlorosulphonic acid in drums.

Du Pont will carry on supplying drummed sulphuric acid and oleums up to 20 per cent, although the location for the facility has not been determined. The decision to relocate the units was based on analyses that indicate the Wurtland investment would reduce operating costs and improve efficiency, as well as make Grasselli's remaining operations more cost effective.

Du Pont is the only US maker of chlorosulphonic acid. The acid and sulphur trioxide are used as intermediates for soaps, plastics, dyes and drugs.

CHINESE ORDER FOR LUM-MUS/DU PONT

Zhong Yuan Petrochemical United Corp has selected Lummus Crest's technology for a new ethylene plant to be located near Puyang City, Henan province, China.

This award marks the 12th time in recent months that Lummus Crest's SRT (Short Residence Time) pyrolysis technology has been chosen for a grassroots ethylene project.

The Henan plant will also employ Du Pont Canada Sclairtech technology for the production of polyethylene. Lummus Canada will provide the basic engineering design for this facility which will be the contractor's seventh such PE unit in the last two years.

The ethylene plant is the seventh grass roots ethylene unit to be built in China using the Lummus Crest SRT technology. Scheduled on stream in 1992, the complex will produce 140,000 ton/year of ethylene and 140,000 ton/year of PE from ethane, propane, butane and light naphtha feedstocks. The estimated total installed cost of both plants is \$180m.

FLUOR DANIEL WINS SHELL'S STANLOW ETHYL BENZENE UNIT

Fluor Daniel has won the race to supply Shell Chemicals' ethyl benzene (EB) plant at Stanlow in the UK. Shell has confirmed that the contractor' is working on the design of the project and said that final approval for the plant's construction, which is likely to cost around £50m (\$85m), is yet to be sought from the company's main board. The plant will be designed to produce 160,000 ton/year of EB.

At the end of February this year Shell applied to the Ellesmere Port & Neston Borough Council for an outline planning permission to build the plant. Based on the Badger alkylation process, the unit will use ethylene supplied in dry gas from the adjacent catalytic cracker (the gas is now used as fuel gas). Benzene feedstock will be sourced from the local aromatics complex. The EB will be exported.

Shell declined to say what it intends to do with the product but it is thought that the plan is to ship the EB to the company's Moerdijk site in the Netherlands where Shell is expanding a styrene monomer plant from 320,000 to 480,000 ton/year for completion early in 1991. This expansion would require roughly 160,000 ton/year of EB.

Shell is also reportedly negotiating with engineering companies a project to replace an existing EB plant at Moerdijk. Like Stanlow, it will use the Badger processes.

Fluor Daniel's track record of working on the Shell site at Stanlow is thought to have helped the contractor secure the EB job. Fluor completed a gas tails project there two weeks ago and is currently working on an HF alkylation unit. This project is running to schedule and is due on stream in early June.

Four contractors completed for the EB order: Badger, M W Kellogg, Davy McKee and Fluor Daniel.

BP IN PE DEAL, SHORTLISTS FIRMS

Eastman Kodak Co. has signed a licence agreement with BP Chemicals for the use of BP's gas phase technology to produce polyethylene.

The plant is to be constructed at the Eastman Chemicals division's, Texas Eastman Co. site at Longview, Texas, US. The design capacity will be 117,000 ton/year and commissioning is planned for the first quarter of 1992.

Under a \$300m programme at Longview, Texas Eastman is also installing a 100,000 ton/year Union Carbide Corp. Unipol-process polypropylene unit, doubling PP capacity at the site by 1991.

The investment plan also includes the construction of a 30,000 ton/year amorphous polyolefins facility as well as the expansion of an oxo aldehydes and derivatives unit, plus neopentyl glycol and Eastotack resins plants. The amorphous polyolefins (used mainly in hot melt adhesives) project will use the company's own technology.

The company's Longview complex comprises some 40 major chemical and plastic facilities, including four cracking plants with an overall capacity of 590,000 ton/year of ethylene and 300,000 ton/year of propylene. The existing PE units -- all ldPE high-pressure -- have capacity of 280,000 ton/year.

"We have several options of producing our own, or buying in, more ethylene or shutting down some existing ethylene consuming units", a spokesman for Texas Eastman said, adding that the company is always looking ahead to the future but "it would be misleading to say we have plans to build a new cracker". Meanwhile, only two engine companies are now in the running BP Chemicals ethylene expansion ject at Grangemouth in Scotland

MW Kellogg and Stone & W have been asked to prepare a p design package for the project by May. Lummus Crest is no longer competition.

The existing facility at Granger supplied by Stone & Webster in is designed to crack naphtha or to produce 270,000 ton/year of eth. The plan now is to double capacituse North Sea LPGs as a feeds

Total cost of the project has be at around \$350-400m, which is the to be on the higher side considering cold end of the plant is already in However, the investment may in LPG handling facilities such as nal, storage and refrigeration.

TOMSK METHANOL UNIT T EXPANDED

The Soviet ministry of the che industry (Minchimprom) has talks with Davy McKee to mod and expand the Tomsk, Siberiamethanol plant built by the UK co tor in the early 1980s. The plant, the two 750,000 ton/year methanolities delivered by Davy t USSR, will probably be expand around 20 per cent.

ICI, the process licensor, has a to buy additional methanol fro plant to provide the foreign exc needed to fund the project.

Under the original compensation involving the two plants (the oth is at Gubakha), ICI has been 300,000 ton/year of the produc 1983. The chemical-grade meth delivered to several European dutions, including the UK, but so have fluctuated according to pavailability, the UK producer s

Environment

VR FIRMS UP PLANS FOR EW DUTCH INCINERATOR

Dutch waste management oup AVR is planning to spend 10m on a new incineration plant esigned to increase the cominy's capacity by 70,000 ton/ ear. The plant, currently waiting r the final go-ahead from the pard, is due for completion in arly 1991. At the same time VR will be upgrading an existing tary kiln, built in 1972, to conrm with new air pollution regutions and to extend its life by a rther five years

With the new plant, the Dutch mpany will have a total incineraon capacity of 205,000 ton. VR's intention is that the expanon programme will allow it to Bet almost the entire Dutch deand for incineration. The group relying on figures that suggest at the Dutch market for waste cineration will reach 210,000 n by 1992. According to den den, AVR's deputy director s figure indicates that there will a zero increase in waste proction. Any rise in demand will m instead from more efficient ste collection and a move away m landfil.

And AVR is banking on a dewase in Dutch hazardous waste er 1992 due to the introduction cleaner processing technology. VR's figures are very different those produced by the Dutch mical industry association VN-late last year VNCI predicted it last year's shortage in incintion capacity would be exacersed when the ban on incineran at sea comes into force. R however expects this to intase by only 20,000 tons as a ult of the ban. This figure re-

rent waste incinerated at sea, the rest of which is not Dutch in origin, the company claims.

AKZO UNITS TO SHUT

Dutch chemical company Akzo is to close down its perchloroethylene and carbontetrachloride plants in Delfzijl early next year as part of a Dfl. 20-30m (\$9.5-14m) pollution reduction scheme. The plants turn out some 30,000 ton/year of the materials

Carbon tetrachloride is currently used in the production of CFCs at Akzo's Weert factory. But a new Rotterdam plant is due to come onstream next year to produce dimethylether as an alternative CFC raw material. In the interim period the company will rely on buying carbon tetrachloride from third parties.

Akzo has been involved in a long-standing dispute with local authorities and environmental groups over its Delfzijl site. It is the second largest Akzo site in the Netherlands and produces salt, chlorine and chlorinated hydrocarbons, among other products.

Chlorinated hydrocarbon emissions have long exceeded legal limits and now have to be brought into line with statutory requirements by October 1, 1990. Akzo is currently building an incinerator for waste hydrocarbons.

GERMANS DISPUTE RIVER CLEAN-UP

In West Germany, the environment minister for the state of Hesse, Karlheinz Weimar, has urged the federal government and the states bordering the Weser and Werra rivers to increase their offer of financial aid to East Germany for removing salt pollution from the two rivers.

The federal government and the states of Hessen, North Rhine-Westphalia, Lower Saxony and Bremen have offered to pay DM-2COm (\$106m) for the clean up, but the East German government has claimed that this is not sufficient to guarantee financing the project. Weimar has called on the West German environmental authorities to resume talks with East Germany.

The cause of the salt pollution is potash mining, but both countries claim the other is responsible. West Germany has two potash mines on the Werra and Wester rivers, while East Germany has three. At some measuring stations, levels in West Germany have reached as high as 20,000 mg litre of water

HSE INVESTIGATES ICI

The UK's Health and Safety Executive (HSE) has been called in to investigate last month's accident where a van carrying 800-kg of commercial explosives owned by ICI blew up. One firemen was killed and 67 people were injured.

The HSE Factory and Explosive inspectors will try and establish just what caused the explosion. Results of the enquiry will be published and "the lessons learned from this incident, particularly for the safe carriage of explosives by road, will be brought to the attention of the industry," the HSE has said.

New regulations requiring lorries carrying explosives to carry

hazard warning labels are expected to be laid before the UK parliament this month.

DU PONT SEEKS GREEN OPPORTUNITIES

The chemical industry should not see the many environmental demands facing it as pure problems but should view them rather as opportunities, was the assertion made by Du Pont's vice chairman, E P Blanchard, at the recent Societe de Chimie Industrielle Forum, held in Paris.

While some environmental demands are driven more by emotion than by fact, he adds, the industry must be prepared to improve its image — one currently tarred by the epithet "polluter"— and thus increase the perceived value of the products it produces.

Conceding that some problems—such as that of CFC use—can only be solved through international cooperation, the vice chairman cited many examples where his own company had not only improved its public image but also solved serious environment problems and at the same time made a profit.

For example, at one plant near Houston, Texas, calcium sulphate is produced in the manufacture of hydrogen fluoride. Over many years, this had developed into a solid waste problem involving a waste mountain of some 4m ton of byproduct but: "Because people are now encouraged look for opportunities in such areas." said Blanchard, "plant management helped develop a mar ket for calcium sulphate, as a soil stabilizer in the local construction industry. In the first year, 1987, sales equalled production.

BECHTEL VENTURE LAUNCHES NEW WASTE TECHNOLOGY

A Potentially competitive technology for waste incineration will soon be available following the signing this week of a marketing agreement between Bechtel and Montana Precision Mining Ltd (MPML).

Based on plasma arc technology, the process was devised by a US inventor who teamed up with MPML to carry out development and testing. MPML claims the process, called Skygas, can be used to convert carbon containing wastes to a gas stream comprising 87-95 per cent hydrogen and carbon monoxide. The firm adds that the gas produced can be used as an energy source or processed as synthesis gas to downstream chemical products such as ammonia, urea and methanol.

Testing has focused on domestic refuse and waste from the wood pulp sector. Work on chemical waste destruction will start this month.

MPML and Xytel-Bechtel recently tested the process on municipal waste to which PVC had been added. The product gas and ash were tested by an independent laboratory and no dioxins were found: in comparison inefficient incineration of chlorinated organics results in the generation of potentially carcinogenic dioxins.

Other tests carried out on wood pulp sludge demonstrated that 1,000 pound of material could be gasified in 35 seconds leaving only 1 pound of ash. Ash production is dictated by the inorganics content, such as sand and metals. MPML says the process can be adapted to handle contaminated soils

The process takes in waste terial through the top of a prin reactor, where electrothermal chemical reactions are initia and maintained by electric ar The gasification process genera hydrogen, carbon monoxide, oxide and methane. This stre contacts fresh feed as it flows through the primary reactor. gas is treated further as it ent the top of the secondary reac where it contacts high temper ture coke and is subjected to ac tional electrothermal and che cal reactions.

The product gas exits the tom of the secondary reactor a medium BTU gas consisting processing process. Ash is removed, from the bottom of the first reactor. It process can be operated continuously or in batch mode, says MML. The firm adds that the unare modular and can be simpled at the factory a transported to the waste tree ment location.

An MPML spokesperson put price of between \$4-6m on 1 basic units, which have optimic capacities of 7-8ton/hour. Ope ting costs are relatively high to cause of the electricity requirements, although MPML believes the units will be competitive high temperature incineration.

The agreement with Bech will involve financing and all possibly manufacturing and m keting of process licences. Acc ding to MPML, the venture waste treatment, including chericals.

To date only a handful studies have been carried out plasma arc technologies apply to hazardous waste destructivalthough systems have been up

ne metal industry for some

destroy hazardous waste to a h higher efficiency compared onventional incinerators. This result of the very high rate of ative heat transfer from the ma arc. Also the process the involves pyrolysis, requires ally no oxygen. In contrast, nerators use large quantities ir to promote complete comion.

a result plasma arc procesavoid costs associated with gas stream namely the cost eating prior to combustion downstream cleaning

wever, it is noted that the exely high temperatures genein the reactors could lead to rtenance problems.

SETS OUT RECLAMATION

Plastics is planning to set recycling business for its enring thermoplastics. Negons are underway with potenartners for a joint venture. If alks fail, however, GEP plans it alone.

e company believes it is imnt to solve the problems of
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cording to the company's regregorian to the carried out mically. High grade plasues

used in food packaging can be recycled into car components and then again into construction applications, each time as a lower grade. This cascade system can extend plastics life cycles to over 40 years.

While plans are at an early stage, Hansler predicts the GEP programme will be recycling several hundred thousand ton/year in 5-10 years.

COURT AWARDS DIOXIN DAMAGES

A Court in Hamburg, West Germany, has recognized dioxin poisoning as the cause of occupational disease, and awarded compensation to the widow of a former employee of Boehringer Ingelheim. The worker, who died of cancer during the proceedings, was employed at Boehringer's lindane pesticide plant in Hamburg and is one of several exworkers suing the firm.

The pesticide plant was closed in 1984, following the introduction of stricter dioxin emissions regulations. Dioxins are generated during the processing of hexachlorocyclohexane (HCH), a byproduct of lindane manufacture.

The court held that the employee's cancer was directly related to dioxin contamination in the plant and ordered the chemical industry liability insurance association to pay full pensions benefits to the workers widow.

CFC PHASE-OUT BY END OF CENTURY

An accord to speed up the phaseout of chlorofluorocarbons (CFCs) has been agreed by 80 countries attending a meeting of

the United Nations environment programme in Helsinki, Finland. The agreement calls for the complete phaseout of CFC production and consumption by the year 2000, and will eventually amend the Montreal Protocol which set a 50 per cent reduction target by the end of the century.

Surprisingly, both China and India signed the accord despite opposing such a strict phaseout programme when it was discussed earlier this year at a meeting in London.

However, the agreement includes a clause to take account of the special situation in developing countries. Delegates attending the meeting also agreed to set up a fund for developing countries to evolve technologies to produce CFC substitutes.

Around the time of the London meeting, the European commission and US announced plans to stop using and making CFCs by the end of the century.

Meanwhile, the West German major Hoechst has brought forward its plans to phase out CFC production, and decided to invest in an alternatives facility in Frankfurt.

Hoechst managing board member Hans-Georg Janson says the company's CFC production will cease in 1995. Earlier, the firm had said complete phaseout was not possible before 1999.

After 1995, Hoechst will supply customers with partially halogenated HCFC-22.

By 1992 or 1993, the company is scheduled to commission a new 10,000 ton/year unit for non-chlorinated fluoracarbons, HFC-125 and 152a.

The company produced 73,000 ton of CFCs in 1988, some 7.3 per cent of the world market

Technological Scene Abroad

DU PONT JV AIMS AT HIGH VALUE RECYCLED PLASTICS

In the US, Du Pont is making a major move to expand its plastics recycling business through a planned joint venture with Waste Management Inc. The venture will link one of the world's largest plastic polymer producers with one of the biggest waste collectors

Within five years the two companies expect to be recycling over 90.000 ton/year of plastics in the US. Expansion outside the US is also likely with in one to three years.

The agreement should be signed in the next two months and initially the Du Pont Waste Management operation will invest in a 18.150 ton/year facility for reclaiming plastics. Start up of the unit, which will cost \$5m, is scheduled for early next year. The chemical major says potential locations include Ohio, Tennessee and Kentucky in the Mid-west and possibly the West Coast.

According to Du Pont's recycling business development manager Gerald Ehrens expansion will depend on the success of the refuse collection system and the development of market for recycled products. The firms say the joint venture provides the entire infrastructure for plastics recycling including collection, separation, sorting, reclamation and upgrading.

Pont's strategy is to develop technology to upgrade recycled plastics to high value products. Traditionally, plastic recyclers have produced lower grade polymers to the wastes processed. Key products for the venture are fibres and high density plastics with ap

plications in cars, containers and buildings.

Du Pont lists three operations in plastics recycling processes that it believes are important to get right. First, separation of plastics into different types; if polymers are intermingled the value of the recycled product drops. Second, efficient recycling to get rid of contaminants. And finally, compatibilization of recycled polymers.

Initially the venture will concentrate on polyester used in carbonated drink bottles and high density plastics. Ehrens notes that in the US 90,000 ton/year, or some 20 per cent, of polyester bottles are recycled. Yet total plastics recycling in the country is less than 1 per cent.

Du Pont says the recycled material will be a significant feed-stock source. By developing technology to give high value products, the company believes plastics reclamation makes economic sense and fits in with the environmental pressure to reduce waste volumes. Polyester in carbonated drink bottles has an average life cycle of 2 months, in automotive parts it is extended to 7 years and in building products to 20 years.

BAYER ZECLITES R&D

In West Germany, Bayer has teamed up with the University of Stuttgart in an R&D project aiming to improve catalytic synthesis of functional organic compounds and fine chemicals using zeolite catalysts.

The work, which is part sponsored by the government will involve developing new zeolite catalysts. According to Bayer, early tests carried out on a process for catalytic synthesis of substituted aromatics have shown promising

results, including a reduction unwanted by products.

The firm is building a plant at Leverkusen to test process further.

PENTAMIDINE FDA APPRO

In the US. LyphoMed's appentamidine preparation has recommended for approval to food and drug administra (FDA) advisory panel. The can prevent a form of pneuroscience which currently kills 80 per cf Aids sufferers. According ports, it could only be a mat weeks before the treatment final approval.

estimates for the eventual of the market for pentamidial around \$120m/year. Lyphowhich has sold pentamidine jectable form since 1984, around \$30m/year of the dru

SWISS TO BUILD WASTE DISPOSAL UNIT

A new toxic waste displant is to be built in the C of Valais, Switzerland. The cexpected to serve Lonza C cals, the Swiss producer of lizers and preservatives.

The new complex will be first example of the Swiss which states that responsifor toxic waste disposal should shared by industry and local thorities. Lonza will put SI (\$12.2m) in the new project SF10m being supplied by government.

The company will not be only one to use the new wast posal plant, where waste wincinerated and some neutrand buried. Work on construct of the new unit should begin in the year, once approvable been granted by central grant.

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Plans are now afoot to bring out the Eighth Edition of our CHEMICAL WEEKLY BUYER'S GUIDE Among the many features being planned is a comprehensive listing of manufacturers/dealers/indenting agent of chemical and allied products, chemical plant & equipment, instruments, machinery etc. To make the BUYER'S GUIDE an authentic source-book we seek your co-operation. Kindly fill in this questionnaire and return it to the address shown above, as early as possible. PUBLICATION OF YOUR ENTRY IN THE BUYER'S GUIDE IS ENTIRELY FREE AND WITHOUT ANY OBLIGATION. When filling up this questionnaire be as detailed as you please. For convenience of indexing do not use abbreviations for chemicals and use only generic names. Trade names where mentioned should be accompanied by generic names. If space in this form seems insufficient do not hesitate to give details separately.

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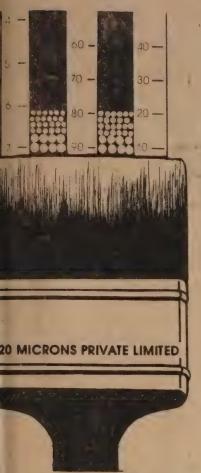
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e to power cut titanium dioxide ction is affected and the supply y dull. The prices of titanium de anatase grade shoots up Rs. 110 to Rs. 137 and rutile from Rs. 120 to Rs. 145. With easy availability of PVA, the

prices have come down quoting PVA (173) at Rs. 125 and gohsenol GH-17 at Rs. 110 per kg. Benzene rose to Rs. 11.25 per litre. H. Acid prices have come down to Rs. 20 per kg. The dyes section remains steady.

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nium sulphate	2.50	Bisphenol-A	82.00	Cream of Tartar (Tech.) China	70.00
onium phosphate (Mono)	14.50	Butyl carbitol	110.00	Citric acid (Belgium) (Resale)	47.00
	14.00	Caustic soda (Flakes)	13.00	Citric acid (Indian) (Resale)	47.00
onium phosphate (Di)				Copper sulphate	24.00
onium carbonate (Di)	17.00	Caustic soda (Solid)	12.00	Chromic acid	61.00
onium bicarbonate	5.60	Caustic soda (Lye)	7.00	Ethylene urea	58.00
onium chloride	3.00	Calcium chloride 70% (Solid)	3.25	Ferric chloride (Lumps)	5.50
onium nitrate	6.00	Calcium chloride 75-80%(fused)	3.50	Ferric chloride (Anhydrous)	16.00
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Industrial Wax	40.00	Sodium nitrite (Resale) per 50 kg.		Benzo trichloride
Litharge (Took)	31.25	Sodium chlorite 80% (Spain)	88.00	Benzoyl chloride
Lead Acetate (Tech.)			5.00	Bromine Liquid
Lithopone	18.50+ST	Soda Ash (Tata)	4.50	Chloroform
Magnesium chloride	1 OF . CT	Soda Ash (Birla)	4.50	Carbon Tetrachloride
(Crystal)	1.25+ST	Soda Ash (Imp.)	7.50	Cellosolve
Menthol crystal (Flakes)	900+Ex+ST	Sodium bicarbonate	4.50	Cyclohexanone
Menthol bold	665+Ex+ST	Sodium bisulphite	3.00	Cyclohexanol
Menthol crystal cold	700+Ex+ST	Sodium silicate	5.00	Diacetone (Resale)
Magnesium carbonate (Japan)		Sodium acetate	260+ST	Diethyl Oxalate
Magnesium carbonate (Indian)		Sodium alginate		Diethyl glycol (DEG)
Maleic Anhydride (Resale)	37.00	Titanium Dioxide (Anatase)	137.00	
Mercury (175 lbs)	13,000.00	Titanium Dioxide	4.45.00	Dioctyl Phthalate
Nickel chloride	110.00	(Rutile RCR ₂)	145.00	Diallyl Phthalate
Oxalic acid (Resale)	24.00	Tartaric acid	102.00	Dimethyl Phthalate
Peppermint oil		Trisodium phosphate	5.50	Dioctyl Adipate
(Rectified)	195+Ex+ST	Thiourea	83.00	Dibutyl Adipate
Potassium carbonate (Indian)	22.00	Urea (Tech.)	2.90	Dipentene
Potassium carbonate		Vacuum salt	1.00	Dimethylamine 40%
(Imported)	29.00	Zinc Dust	32.00	Dimethylamine 50%
Potassium bichromate	32.50+ST	Zinc Oxide	52.00	Ethyl Acetate
Potassium phosphate (Môno)	14.00	Zinc chloride powder		Ethyl Acrylate
Potassium phosphate (Di)	14.00	(Tech.)	12.50	Ethylene Dichloride
Polyvinyl alcohol (No. 117)	120+ST	Zinc sulphate	7.00	Ethylene Glycol
Polyvinyl alcohol (No. 173)	125+ST			Formic Acid (Imp.)
Polyvinyl alcohol (No. 208)	155+ST			Formaldehyde (Resale)
Paraformaldehyde (Resale)	24+ST	SOLVENTS	Per Kg.	Glycerine (CP)
Phthalic anhydride 36%				Glycerine (IW)
(Resale)	27.50	Acetic Acid Glacial (Resale)	15.00	Hydrogen Peroxide 50% (Resale)
Pentaerythritol (Resale)	. 45.00	Acetic Anhydride (Resale)	32.00	Isopropyl Alcohol
Paratfin wax	18+ST	Acetone (Resale)	16.00	Isobutyl Alcohol (Resale)
Rangolite (German)	80+ST	Adipic Acid	57.00	Monoethanolamine (Resale)
Rangolite (Czech.)	65+ST	Aceto Acetanilide	55.00	Melamine
Sodium sulphate (Fine)	6.00	Aniline Oil	60.00	Methyl Ethyl Ketone
Sodium sulphate (Coarse)	5.00	Benzoate Plasticiser	62.00	Methyl Isobutyl Ketőne
Sodium sulphide 50-52%		Butyl acrylate	78+ST	Methyl Acrylate
(Flakes)	11+ST	Butyl stearate	50.00	Methyl Dichloride (Resale)

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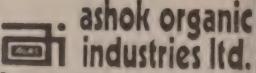
Carbitol	68+ST			MNA	
Meta Cresol	45.00	DYES INTERMEDIATES (PR	ICES ARE	Meta Ureido Aniline	
Nitrobenzene	30.50	WITHOUT TAX AND EXCISE		MPD (Local)	
Nitric Acid (Conc.) (RCF)	2.50			MPD (Japan)	
Ortho Cresol	30+ST	Alphanaphthylamine	62.00	Naphthenic Acid	
Phenol (Resale)	35.00	Alpha Naphthol (Imp.)	185.00	N-Methyl J. Acid	
Propylene Glycol	50.00	Aceto Acetic Ester (Methyl)	65.00	N-Methyl Aniline	
Polyethylene Glycol (No.200)	52.00	Ammonium Molybdate	210.00	Naphthalene (Refined)	
Polyethylene Glycol (No.400)	50.00	Anthraquinone	125.00	Ortho Anisidine (OA) (Imp.)	
Polyethylene Glycol (No.500)	12.79	Anthranilic Acid	80.00	Ortho Dichloro Benzene (ODCB)	
Polyethylene Glycol (No.1600)	14.00	2-Amino 4-Nitrophenol	150.00	OT Base	4
Polyethylene Glycol (No.4000)	70 00	Blue B. Base (Local)	270.00	Para Dichloro Benzene (PDCB)	
Polyethylene Glycol (No.6000)	85.00	Beta Naphthol (Atul)	77.00	Para Anisidine (PA local)	
Para Cresol	110.00	Benzidine Dihydrochloride (Bl		PNA	
Styrene Monomer	40.00	Bromamine Acid	500.00	Para Cresidine (Imp.)	3
Sorbitol	15.00	BON Acid	135+Ex+Ta	Para Amino Azo Benzene	
Sulphuric Acid	2.80	Chicago Acid IRS	330.00	(India)	1
Trichloroethylene	29.50	Coach Acid	52.00	PNCB	
Triethanolamine (Resale)	65.00	C. Acid (Imp.)	190.00	Para Amino Acetanilide	1
Turpentine Oil (Germany)	8.00	Cyanuric Chloride	130.00	1-Phenyl 3-Methyl	
Turkey Red Oil (50%)	20.00	2,4- DNCB	30.00	5-Pyrazolone	1
Vinyl Acetate Monomer	47.50	Dihydrothio PTOS (Imp.)	1,000.00	Phenyl J. Acid	3
, , , , , , , , , , , , , , , , , , ,	47.00	Dimethyl Aniline	75.00	Para Amino Benzoic Acid	1
		Diethyl Aniline	170.00	PT Base	1
		Diamino stilbene		Rhoduline Acid	5
SOLVENTS	Per Litre	disulphonic acid	163.00	Resist Salt 80%	
		3,3-DCB (Imp.)	165.00	Resorcinol	11
Benzene	11.25	Gamma Acid (Atul)	195.00	Sodium Naphthionate	
N-Heptane	10.50	H. Acid (Atul)	130.00	5-Sulpho-Anthranilic Acid	
N-Hexane	12.00	G. Salt	78.00	Sulphanilic Acid	
Methanol	8.50	Isophthalic Acid	45.00	Sulpho Tobias Acid	14
Solvent Naphtha Heavy	10.50	J. Acid	300.00	Trichloro Benzene (TCB)	-
Solvent Naphtha Light	8.50	J. Acid Urea	385.00	Tobias Acid	15
Toluene	23.50	K. Acid	122.00	Metanilic Acid	
Xylene	19.00	MPDS (German)	210.00	MTD	40
		- Continuity	2.10.00	WILD	1 4



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Bombay Dyes Market

(Prices as on June 6, 1989)

			005.05	D-40D	
ACID COLOURS	Don V.	Brill. Fast Helio 2R	385.85 177.30	Red 2B	
ACID COLOURS	Per Kg.	Brill. Fast Helio 2RS		Red Violet FBL	
		Brill. Fast Helio BS	116.10		
Acid Violet 4BS	*190.00	Brill. Violet Extra	181.45	Orange 3R	
Acid Maroon V	110.00	Blue 2B	102.50	Violet 3R	
Acid Orange II	112.55	Blue G	220.45	Violet RL	
Acid Orange IIY	93.85	Sky Blue FB	. 242.00	Violet 6R	
Acid Red A	137.00	Copper Blue GR	190.25	Scarlet RR	
Acid Scarlet 3R	128.35	Fast Greenish Blue GL	114.60	Rubine 3B	
Acid Red 3BN	*195.00	Developed Black BT	149.95	Rubine CB	
Acid Red R2R	132.00	Blue NB-2B	348.45	Blue GL	
Acid Red RS	88.00	Blue NB-2BG	214.70	Blue BGF	
Acid Patent Blue AS	*280.00	Developed Black NB-GHB	214.70	Navy Blue RE	
Acid Green V	*375.00	Green B	142.75	Brown 3REL	
Acid Coomasi Blue	200.00	Green NB-B	218.90	Black GEL	
Acid Yellow 5GN	65.00	Green 2B-N	218.90	Dark Brown 3B	
Acid Red PG	85.00	Brown MR	197.40		
Acid Red GRS	78.00	Brown CN	137.00		
Acid Black 10 BX	157.15	Golden Brown G	175.85	BASE COLOURS	
Acid Black BX	126.95	Catechin G	155.70		
Acid Black Wax	135.50	Omega Tan	161.45	Fast Yellow GC	
Crosein Scarlet MOO		Catechin GS	102.80	Fast Orange GC	
Procinil Yellow GS (ICI, UK)	265.00	Black E Hly. Conc.	180.15	Fast Scarlet R	
Procinil Red GS (ICI, UK)	530.00	Black E Extra Hly. Conc.	180.15	Fast Scarlet RC	
Procinil Blue RS (ICI, UK)		Black NB-ER Hly. Conc.	290.50	Fast Scarlet RCR	
Procinil Scarlet G (ICI, UK)	600.00			Fast Scarlet G	
Procinil Orange G (ICI, UK)				Fast Scarlet GN	
Procinil Rubine (ICI, UK)		DISPERSOL COLOURS	Per Kg.	Fast Scarlet GG	
* To get resale price add 6% to			10, 13.	Fast Scarlet GGS	
		Red B 3B Conc	611.50	Fast Red B	
		Red B 2B Conc		Fast Red RC	
DIRECT COLOURS	Per Kg.	Red CB Powder	1048.25	Fast Red R Flakes	
	rei kg.	Red D2B Powder	589.85	Fast Red TR	
Yellow 3GX	114.00	Violet C 4R Conc.		Fast Red TR Oil	
Gun Yellow RCH	175.85	Blue BG Conc	580.65	Fast Red RL	
Fast Yellow GCH	454.50	Blue BN Powder	128.20	Fast Red KB Oil	
Yellow CFG Hly. Conc.	721.00	Blue D 2R Powder	588.25	Fast Bordeaux GP	
Fast Yellow GS	126.96	Navy BT Conc	531.95	Fast Garnet GBC	
Fast Yellow CHRS	116.85	Blue B 2G Conc	577.95	Fast Violet B	
Viscose Orange A	210.35	Black BT Conc	319.50	Fast Blue BB	
Fast Orange GR	171.50	Blue BR	482.40		
Red	122.65	Yellow 7GL	813.20		
Dark Tan	98.15	Yellow 5RX	269.90	NAPHTHOL COLOURS	р
Red IIR	98.15	Yellow 3G	473.20	MAPHINOL COLOGNS	-
Red 4B	217.55	Yellow	140.00	ASG	
Bordeaux BW	170.10	Yellow AL	167.20	AS	
Fast Scarlet 4BS	223.50		311.70	ASSW	
Red 12B	220.45	Yellow FFL	571.40	ASBS	
Bordeaux Hly. Conc.	249.20	Gold Yellow GG	320.80	ASBO	
Cotton Red N	117.05	Pink REL	593.00	ASD	
Brill. Fast Helio B	362.85	Red BEL	615.60	ASOL	1

	. 369.00	Blue H-FRD	305.80	Brill. Purple 2R Hiy Conc.	744.25
	336.05	Navy Blue H3R	333.75	Brill. Purple 4R Supra Disp.	
	236.00	Blue H 5RX	286.20	Brill. Purple 2R Acra Conc.	779.85
	249.95	Navy Blue M3R	355.70	Blue 2R Powder Fine	675.30
	2002.35	Brill. Blue MR	405.60	Blue BC Acra Con Pdr. Fine	1013.15
	2459.45	Brill. Blue M RX	214.20	Blue BC Conc. Pdr. Fine	713.65
	143.00	Brill. Blue M-G	226.45	Blue R Conc. Pdr. Fine	719.70
	538.65	Blue M 4GD	369.40	Blue Conc. Powder	645.80
	652.60	Navy Blue M RB	341.85	Brill. Blue 2R Hly. Conc.	378.55
		Turquoise M-G	240.30	Blue RR Supra Powder	629.35
	0	Brill. Blue M GX	516.25	Brill. Blue 2R Supra Disp.	115.65
ON COLOURS	Per Kg.	Blue 3R Acra Powder	718.20	Dark Blue 2R Powder Fine	512.65
. (Dark Brown H 6R	248.45	Blue BC Supra Disp.	419.65
Yellow HR	207.95	Cobalt Oxide	285.00	Jade Green XBN Powder Fine	555.80
ellow H4G	145.65	Green H4BD	287.00	Jade Green XBN Acra	
Yellow H-8GP	168.55	Green H-E4BI	169.80	Conc. Pdr	1026.05
ellow HE6G	214.75	Red Brown H IF	143.25	Jade Green 2G Pdr. Fine	533.25
G-E4R A STATE OF THE STATE OF T	276.05	Orange Brown H 28	209.05	Jade Green 2G Ptg, Paste .	125.40
ellow H7G	332.30	Brown M GRN	188.80	Jade Green XBN Ptg. Paste	126.00
M4R	275.45	Black H-N	314.20	Jade Green 2G Supra Disp.	618.00
MGR : S S S S S S	387.65			Olive D Pdr. Fine	563.90
ellow M4G	201.15			Olive Green B Supra Disp.	421.70
ellow M8G	366.10	SULPHUR COLOURS	Per Kg.	Jade Green XBN Supra Disp. (N)	327.30
M3R	244.70			Olive OMW Powder Fine	698.55
range H2R	303.80	Navy Blue	210.35	Olive OMW Supra Disp.	538.05
ed H7B	157.95	Green G	194.55	Olive D Supra Disp.	361.70
range M2R	313.15	Black Grains Extra	72.25	Olive R Supra Disp.	470.25
ed H8B	213.55	Black Grains OG	73.70	Olive D. Ptg. Paste	193.00
carlet H RN	245.05	Black GXE Conc.	70.85	Olive Green B Ptg. Paste	199.10
Red H-3BP	179.80	Black GXE	57.90	Olive Green B Acra Conc.	741.10
∋d H-F3B	243.45	Black GXR	69.40	Olive R Acra Conc.	779.85
agenta HB	182.00		62.80	Brown R Pdr. Fine	869.45
ed M 5B	160.05	Black EXR Grains	73.70	Dark Brown 3R Fine	826.25
∌d M 8B		Black EXR Grains 800	59.35	Brown G Supra Disp.	582.05
mk MB	137.10			Brown 2G Supra Disp.	716.10
agenta MB	163.65			Brown R Supra Disp.	547.35
mrple H-3R	219.55	VAT COLOURS (ICI)	Per Kg.	Brown BR Powder	867.75
urple H-7R	175.40	The state of the s	EC4 65	Dark Brown 3R Ptg. Paste	217.15
lue H 3R	333.75	Yellow 5G Supra Disperse	561.85	Dark Brown 3R Supra Disp.	529.60 967.95
ue H-GR	406.40	Yellow 5G Acra Conc	818.60	Brown G Acra Conc.	768.80
	207.95	Gold Orange 3G Pdr. Fine	1158.45	Brown M. Powder Fine	585.45
!5RX	286.20	Brill. Orange 6R Pdr. Fine		Grey M. Supra Disp.	762.70
ue H 7G	213.95	Gold Orange 3G Supra Disp		Blue BC Acra Conc. Pdr. Fine Direct Black AC Supra Disp.	415.75
Je H 7RX	358.15	Brill. Orange 6RX Powder		Direct Black AC Supra Disp. Direct Black AC Pdr. Fine	574.70
se HA	265.05	Brill. Red 3B Pdr. Fine		•	490.45
Blue H-3RP	595.30	Brill. Red 3B Supra Disp		- HOOL DIAGN OFF STATE	217 15
Surquoise H 2G P	181.50	Brill. Purple 3R Acra Powder	827.03	DIRECT MODIFIES. Pasto	

Madras Market

Markets have been quite buoyant this week with prices of seasonal items going up. The total power-cut in Kerala had its share in putting up the rates of items like titanium dioxide, both rutile and anatase varieties which reached an all time peak. Phenol prices have been put up by the manufacturers. Ammonium bicarbonate prices went up on account of closure of Mangalore Chemicals unit manufacturing this

ruled high on account of poor arrivals from manufacturers while prices of methylene chloride have crushed due to heavy imports by drug exporters. MIBK availability continues to be poor due to reported shut down of NOCIL's unit manufacturing this. Aniline availability is very bad due to closure of HOC's aniline plant & consumers of this product have been put to considerable inconvenience.

Magnesium Chloride (per kg) Maleic Anhydride (per kg) Menthol Crystals (per kg) Oxalic Acid (per kg) Paraffin Wax (per kg) Potassium Bichromate (per kg) Phosphoric Acid (per kg) Polyvinyl Alcohol powder (per kg) Pentaerythritol (per kg) Phthalic Anhydride (per kg) Soda Ash (TAC) (per 75 kgs) Soda Ash (TATA) (per 75 kgs) Sodium Bicarbonate (TATA) (per 50 kgs) Sodium Silicate (per MT) Sodium Bichromate (per kg) Sodium Nitrate (per kg) Sodium Nitrite (per kg) Sodium Sulphide Flakes (per kg) Sodium Bisulphite (per kg) Sodium Alginate (per kg) Sodium Acetate (per kg) Sodium Sulphate (Anhydrous) (per kg Titanium Dioxide (Anatase) (per kg) 1 Titanium Dioxide (Rutile) (per kg) Trisodium Phosphate (per kg) Urea (Technical) (per kg) Zinc Oxide (per kg) Zinc Chloride Powder (per kg)

(MADRAS MARKET RATES AS ON JUNE 3, 1989)

Acetic Acid Glacial (per kg)	18.00	Calcium Carbonate (Precipitated)	
Aluminium Sulphate Iron free	10.00		000.00
· ·	4 500 00		
(per MT)	4,500.00	Citric Acid (per kg)	51.00
Ammonium Bicarbonate		Copper Sulphate (per kg)	24.00
(per 25 kgs)	200.00	Cresylic Acid 98-99% (per kg) 138.	00+ED
Ammonium Chloride (per MT)	3,000.00	Pure Para Cresol 96% (per kg) 78.	C3+00
Acid Slurry (per kg)	28.00	Meta Para Cresol 42% (per kg) 47.	00+ED
Barium Carbonate (per kg)	6.00	Formic Acid (per kg)	27.00
Barium Chloride (per kg)	5.50	Formaldehyde (per kg)	8.00
Boric Acid Technical (per kg)	24.00	Glue Flakes (per kg)	15.50
Bleaching Powder (per 50 kgs)	220.00	Glycerine (per kg)	43.00
Borax (per 50 kgs)	700.00	Hydrosulphite of Soda	
Caustic Soda Flakes - Mettur		(TCPL) (per kg)	40.00
Chemicals (per MT)	12,000.00	Hydrosulphite of Soda (IDI) (per kg)	43.00
Caustic Soda Flakes - Andhra		Hydrosulphite of Soda	
Sugars (per MT)	12,000.00	(BASF) (per kg)	43.00
Calcium Chloride 70% Solid		Hexamine (per kg)	30.00
(per MT)	3,000.00	Hyflo Supercell (per kg)	21.00
Calcium Chloride Anhydrous		Hydrogen Peroxide (per kg)	29.00
(per MT)	6,000.00	Litharge (per kg)	40.00
Calcium Carbonate (Activated)		Lead Acetate (per kg)	42.00
(per MT)	5,750 00	Magnesium Carbonate (per kg)	19.50

SOLVENTS

Zinc Sulphate (per kg)

Acetone -- HOCL (per kg) Butanol (per kg) Butyl Acetate (per kg) Benzene (per lit) Cellosolve (per kg) Carbon Tetra Chloride (per kg) Chloroform (per kg) Diacetone Alcohol (per kg) Diethylene Glycol (per kg) Dichloroethane (per kg) Di-octyl Phthalate (per kg) Di-N-butyl Phthalate (per kg) Ethyl Acetate (per kg) Isopropyl Alcohol (per kg) Methanol (per kg) Methylene Chloride (per kg) Methyl Ethyl Ketone (per kg) Methyl Isobutyl Ketone (per kg) Phenol (per kg) Sorbitol (per kg) Triethanolamine (per kg) Trichloroethylene (per kg) 1-1-1 Trichloroethane (per kg) Turpentine (per lit) Toluene (per lit) Xylene (per lit)

Delhi Market

LHI: JUNE 2, (NNS) A steep of Rs. 22 per kg in titanium dioxices provided the main feature ading in the Delhi chemical et during last week reports. The main reason for this sharp rise was attributed to heavy all speculation between stockind distributors caused by acute age of stock reports NNS. Taracid also pushed up by Rs. 200 mercury nosedived by Rs. 400 lask owing to persistent offer-

anium dioxide anatase and 22 jumped up sharply by 22 at Rs. 130 each per kg in the nce of comfortable stock positis well as fall in fresh supply and y mutual speculation among sists and distributors. It is not-ble there that the company rate tanium dioxide anatase was ed at Rs. 55 per kg. Consent heavy premium of Rs. 75 was red in this chemical.

port from France, prices of taracid rose sharply by Rs. 200 at 7,750 per 50 kg. Within a month of Rs. 500 was reported in this Rangolite Germany moved up s. 2 at Rs. 77 per kg on poor position, while chatkolite came from Rs. 67 to Rs. 62 thanks and supply of Chinese goods. In posence of easy stock position sufolite ruled static at Rs. 70 in the wake of higher demand from textile units. Offtake was poor in sodium hydro sulphite.

Paraffin wax advanced by Rs. 30 at Rs. 780 per 50 kg on account of good demand by bakeries. Owing to poor arrival from U.P. alongwith improved demand by consumers at lower rate, menthol flake, medium and bold went up by Rs. 15/20 at Rs. 220, Rs. 265 and Rs. 280 per kg respectively. June delivery menthol flake was transacted at the rate of Rs. 220 per kg. Mentha oil traded higher at Rs. 165 against Rs. 148 and DMO held stable at Rs. 75 per kg. Due to higher rates quoted by companies, carbon tetrachloride moved up by 65 paisa at Rs. 24.65 per kg. In the wake of reduced supply, formic acid U.K. hardened by Rs. 25 to Rs. 26 while D.S.F. softened by 50 paisa at Rs. 27 per kg.

Mercury suffered a steep fall of Rs. 400 at Rs. 12,000 per flask thanks to better supply by actual quota holders. Stock position was also was good. On reports of about 100/125 bags commenced in the market and buyers were out of the market resulted boric acid technical dropped sharply by Rs. 250 at Rs. 1,250 per 50 kg. Borax granular and crystal came down by Rs. 10/15 at Rs. 680 and Rs. 685 in the absence of enquiry. Sodium nitrite was cheaper by Rs. 10 on better offerings.

(DELHI MARKET RATES AS ON JUNE 2, 1989)

nia Bicarb (Per 25 Kg.)	144.00
w (Per flask)	12,900.00
ish (Per bag)	340/345.00
ium Chloride (50 Kg.)	110/180.00
soda flakes (50 Kg.)	540.00
cid (Per 50 Kg.) 2,3	250/2,525.00
Bleaching-Powder	
am (Per 25 Kg.)	100.00
Bleaching Powder KCI	
25 Kg.)	95.00
Bleaching Powder	
i (Per 25 Kg.)	90.00

Stable Bleaching Powder
Modi (Per 25 Kg.) 98.00
Sodium Bicarbonate (50 Kg.) 290/300.00
Sodium Hydrosulphite (Per Kg.)35.00/40.00
Rangolite (Per Kg.) 62.00/77.00
Boric acid Technical (Per 50 Kg.) 1,250.00
Paraffin Wax (Per 50 Kg.) 780.00
Tartaric Acid (Per 50 Kg.) 7,550.00
Borax Granular (Per 50 Kg.) 680.00
Borax Crystal (Per 50 Kg.) 685.00
Sodium Nitrite (Per 50 Kg.) 650/760.00
Sodium Nitrate (Per 50 Kg.) 415.00

Camphor Thal (Per Kg.)	102.00
Camphor Powder (Per Kg.)	92.00
Menthol Bold (Per Kg.)	280.00
Menthol Medium (Per Kg.)	265.00
Menthol Flake (Per Kg.)	220.00
Glycerine (Per Kg.)	52/55.00
Sodium Silicate (Per quintal)	250/300.00
Hexamine (Per Kg.)	36.00
Acetic Acid Glacial (Per Kg.)	15.00
Copper Sulphate	
(Per quintal)	2,250/2,600
Formic Acid (Per Kg.)	26/27.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	27.25/27.50
Calcium Carbonate	
(Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	25.00
Acid Slurry Hard (Per Kg.)	32.00
Phosphoric Acid (Per 50 Kg.)	1,050.00
Potassium Nitrate	
(Per quintal)	000/1,200.00
Potassium Permanganate	* !
(Per 50 Kg.)	4,900.00
Sodium Bichromate	
(Per 50 Kg.) 1,5	75/1,600.00
Trisodium Phosphate (50 Kg.)	480/485.00
Titanium Dioxide Anatase (Per	Kg.) 130.00
Titanium Dioxide RC-822 (Per	Kg.) 130.00
Zinc Oxide	
(Per metric torine) 42,00	0/52,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.00
Chloroform (Per Kg.)	28.00
Sodium Sulphate	
(Per metric tonne) 3,2	50/3,600.00
Naphthalene Balls (Per 50 Kg.)	1,300.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	162.00
Naphthol ASG	252.00
Naphthol ASBS	250.00
Naphthol ASTR	325.00
Naphthol ASOL	208.00
Naphthol ASBO	225.00

DIRECT DYES	(Per Kg.)
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Diazo Black B.T.	105/135.00
Green B	100/127.00
Blue 2-B	60/92.00
Sky Blue FB	213.00
Basic Auramine	55/110.00
Basic Rhodamine	250/400.00
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